



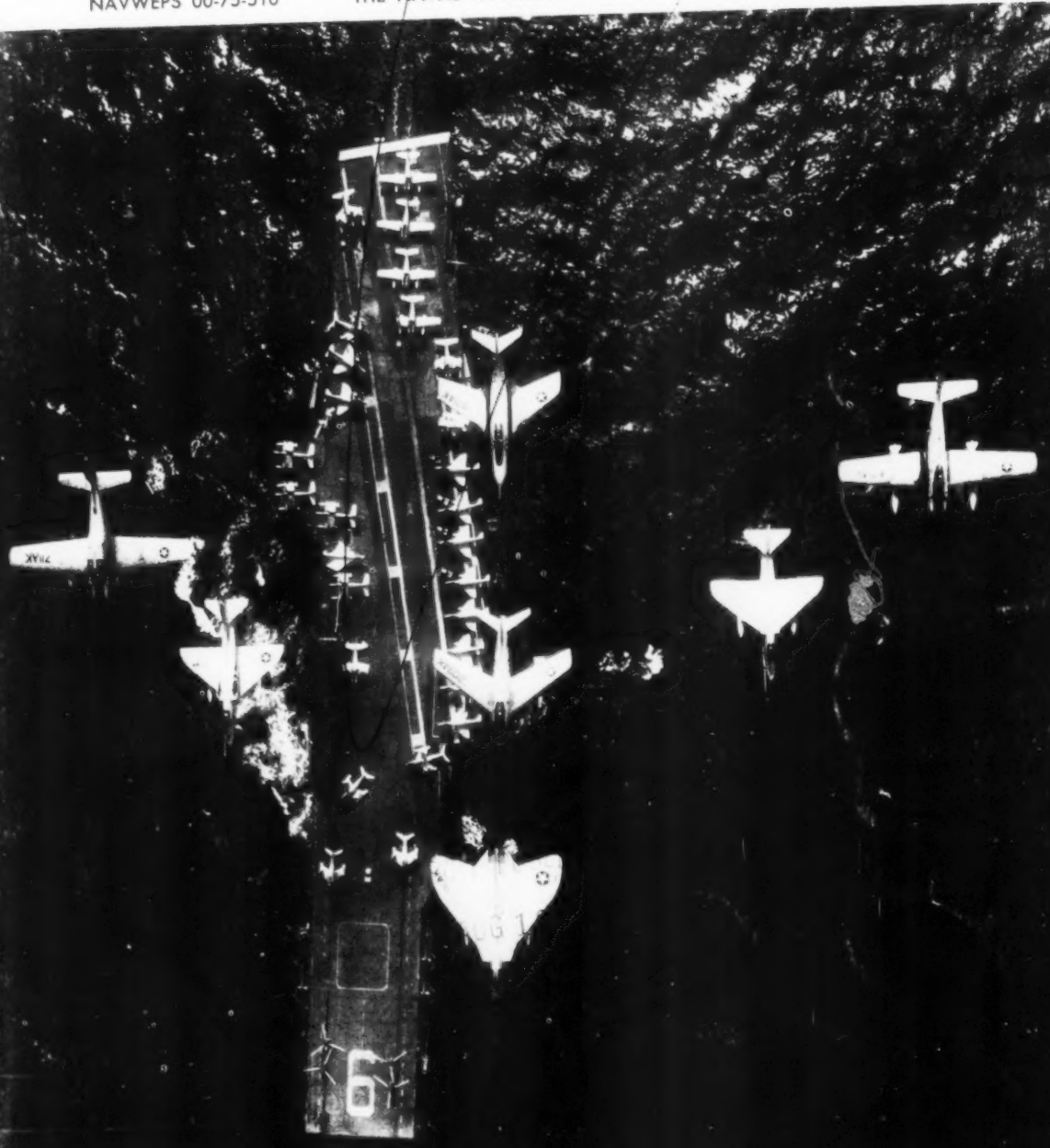
TECHNOLOGY

# approach

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THE NAVAL AVIATION SAFETY REVIEW

AUGUST 1960



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Just like all units in the naval air organization, APPROACH faces the problem of personnel turnover. With this issue, LCDR Bill Thomas ends three work-filled years as Managing Editor. His new assignment takes him to the Mobile Intelligence Production Unit at CinClantFlt Headquarters.

In between his editorial duties and service as a part-time photographer's model for the magazine, Bill has authored many important articles including "E is for Eating," Feb 58; "Tower of Babble," May 58; "Lip Service," Nov 58; "Tiger on the Loose," Jan 59 and "Won't Hurt a Bit," Jul 59.

Bill's easily read, friendly style has always received a warm response from APPROACH readers and will long continue to influence the production of the magazine.

**Purposes and Policies:** APPROACH is published monthly by the U.S. Naval Aviation Safety Center and is distributed to naval aeronautical organizations on the basis of 1 copy per 12 persons. It presents the most accurate information currently available on the subject of aviation accident prevention. Contents should not be construed as regulations, orders, or directives. Material extracted from Aircraft Accident Reports (OpNavs 3750-1 and 3750-10), Medical Officer's Reports (OpNav 3750-8) and Anymouse (anonymous) Reports may not be construed as incriminating under Art. 81, UCMJ. Photos: Official Navy or as credited.

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# Letters



## Right-Hand Men

Sir:

... That old problem of pilot training for JOs in multi-engine squadrons is usually discussed in terms of morale and, indeed, it can be a morale problem.

This is written, however, in the hope of placing the matter in a different perspective—as it relates to fleet readiness and flight safety. It appears that any steps taken toward a solution of the problem can have a direct bearing upon the Navy in terms of dollars, aircraft, and lives saved.

Most of us know many coffee-makers that have chosen civilian life over remaining in naval aviation. This, after a neither particularly happy nor fruitful tour in a multi-engine squadron. Pilot attrition of any type is one of our major problems in the Navy today—who can say how many capable officers and aviators the Navy has lost due to too little pilot training received during the first tour? And how many of the taxpayers dollars spent to train the nuggets necessary to replace them?

In the case of the lads that go to inactive duty to organized reserve billets it's only reasonable to believe that they'll be more capable and proficient (and safer) in direct relationship to the amount of pilot training received while on active duty. An accident in the CNARes-Tra column is just as serious as one in the fleet columns.

A sustained effort should be made by aircraft commanders to exercise every opportunity for training their less experienced pilots. Such an effort should not only alleviate the operational burden sometimes incurred by the OpNav 3740.4 series, but can have far-reaching desirable effects.

I say this with some qualifications. Crew training to perform the required mission must be the

first consideration. The navigator must be able to navigate. The copilot should be striving to be the best in the outfit. The PPC must himself first attain the high level of proficiency necessary to insure the safe and successful completion of any assigned mission—he's the one to whom all eyes will be turned the first time that the chips are down.

Certainly this is not to say that nobody moves from his seat until these primary objectives are attained. There are many opportunities throughout the training cycle for swapping seats without any sacrifice of crew training. A landing for each pilot at the end of a flight can be quite rewarding for the time spent. Available time should be utilized by asking questions, giving instructions, or simulating emergencies.

Probably the greatest single step forward would be greater mutual understanding—an appreciation by the PPC of the natural and desirable urge of the young pilot to try out his wings. (Remember?) No less important that the navigator realize that (1) somebody has to navigate, and under the Navy system, this is normally done by the junior birdman. (This is not meant to cast in a negative light nor to minimize the essential and increasing roles of the navigator), (2) the PPC is responsible for the whole shooting match and must achieve and maintain a high state of proficiency in addition to furthering the training of his copilot.

Until the navigator appreciates all of the factors involved, and until he sees by actions rather than words that every effort is being made to further his pilot training, we'll still be living with this old, old problem and its many implications.

GEORGE CARLSON, LT

FSO VP-19

## Compass Troubles

Sir:

My (VAH) squadron has had a lot of compass troubles lately, and even a good B/N "ain't hardly" gonna be able to navigate properly if the compass is in error.

I had an A3D one night in which I would have been low state 100 miles east of Sanford had not the compass error put in toward CONUS instead of away from CONUS. (Don't tell anybody, I'm the Safety Officer.) Frequent heading checks help, but they are not always the answer.

What do the poor fighter "TACAN ONLY" boys do?

I know of outfits, who shall remain anonymous, that place new compass cards in all aircraft prior to the annual AD/MAT inspection without even getting the aircraft close to a compass rose. There are undoubtedly aircraft in this U. S. Navy that haven't been swung in five years.

VAH ASO

## Kudos

Sir:

A copy of the June APPROACH was given to me for a review of the article on liquid oxygen. . . . The article is extremely well written and well prepared. We wish to extend our heartiest congratulations. It is only through material of this sort that personnel can be made adequately aware of the problems inherent in the correct handling of liquid oxygen and oxygen supply equipment.

K. HOBEIN

Technical Services

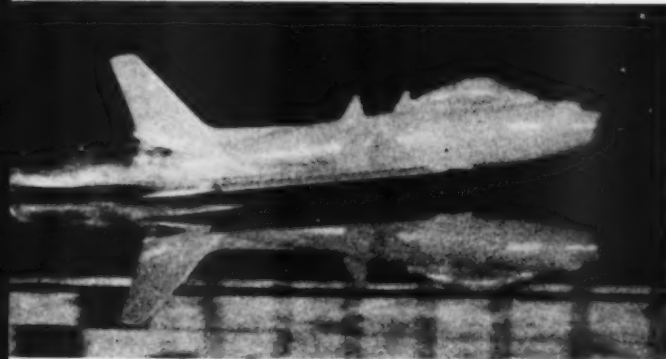
Pioneer-Central Div.  
Bendix Aviation Corp.

approach/august 1960

# DITCHING LAND PL

By LCDR David M. Hume

*From the ocean and the test basin,  
from actual aircraft and scale models  
comes the information on how to make  
the best of a bad situation*



**J**UST how worthwhile is a discussion of landplane ditchings going to be? A backward look at the problem shows that there were 283 such ditchings during the five-year period from 1 July 1954 to 30 June 1959.

If anyone should be concerned about the likelihood of having to ditch, it is the Navy pilot. After all, nearly the entire naval air mission calls for flight over water. And yet, the Air Force has run into plenty of ditching trouble too.

This statement is quoted from "MATS Flyer," Sept. 1959, "Out of the seven incidents only one aircraft reached the water in survivable condition,



and this was a semi-controlled crash. Are we waiting too long to start emergency descent? That's the problem. Tragically expensive in lives and dollars. There is pathetically little factual information to use in combating this enormous problem. But combat it we must, even though we may be clutching at straws."

Before we can do much talking about ditching, or any other subject, we had better define a few terms so we are at least thinking about the same thing. There is no need to agree upon the definitions, only to understand them.

For our purposes then, ditching is the landing

of any aircraft upon water with the intention of abandoning it. The ditching situation arises out of some emergency. The plane may be of any type including seaplanes so long as the common elements of emergency demands and intention to abandon are present. To conform to this definition, the aircraft must be at some speed above stall and the attitude must be under control at the instant of contact with the water.

Now let's narrow the subject matter a little more. Since the ditching, for our purposes, is only the actual process of getting the airplane on the water, we will not dwell on escape nor on

survival technique and equipment.

The seaplane drivers must be acknowledged as the experts in this field since every seaplane landing is a 'ditching' without the ingredients of emergency and intended abandonment. The seaplaners also have the advantage of flying around in a fuselage which is designed to withstand the rigors of water landing. For these reasons, our discussion will be further restricted to include only landplanes, carrier and shore based, props and jets, single and multi-engine, fixed wing and helos.

Your chances are pretty good. In the 283 landplane ditchings mentioned before, there were 569 people involved—that's 569 potential injuries—569 potential fatalities. But it actually turned out to be 43 fatalities and 412 uninjured.

Just in case your mind works better on percentages than plain numbers, this is for you—out of 569 persons who went through a ditching over a five-year period, 7.6% didn't make it, 92.4% survived and 73% weren't even bruised.

Remember, we have left the seaplane people out of this entirely. The helos have been included, however, so take a look at their performance separately. There were 63 helo ditchings involving 185 people—6 were fatalities (3.2%), 179 (96.8%) survived and 151 (82%) were uninjured.

#### When Should You Ditch?

It may sound a little silly to say it, but—you should ditch when it is the only thing you can do. Some stalwarts steadfastly refuse to admit that

they are about to ditch even as they cunningly pick the seaweed from between their teeth.

You should ditch when this presents the best chance for the survival of you and the other occupants, if any, of your aircraft.

One AAR (just happened to be an AD-5W) said it this way, "It appears that the pilot never got the flaps down and definitely did not jettison the drop tanks prior to hitting the water. In addition, he did not have time to level his wings or establish a ditching attitude. In view of the heavy load, the necessity for an immediate left turn after takeoff to avoid obstructions and the low altitude at which the engine lost power, it appears that the only possible error committed by the pilot was that of not recognizing or accepting the fact that he would have to ditch when the trouble first developed."

You're right, the ditching odds are not the same in all types of aircraft (see box). The AD is currently the odds-on favorite in the ditching derby. This AAR quote gives at least one reason why, "This aircraft ditches very well and all aircrewmembers have sufficient time to exit the aircraft prior to its sinking. Because this aircraft ditches well and because of the hazards involved in attempting to bail out of the rear compartment of the AD-5Q, it is recommended that pilots execute ditching procedures whenever feasible to enhance aircrew safety."

The time has come to stop evading the big question and come right down to the matter of dunking a high performance jet. Well, that doesn't look quite as grim as you might expect either.

Our most modern jet aircraft have not been and will not be as good in the ditching situation as their predecessors. It is even possible to predict, as you will learn later in this article, that the F4H and A3J are likely to be very bad ditchers.

The only current jet with a fairly respectable ditching history is the F3H. The rest of them appear to be building a strong case for ejection whenever it can be done with a reasonable expectation of success.

Don't forget that statistics are necessarily historical. Facts and figures about F9s and F2Hs are not going to hold up for F4Ds and F8Us.

Start with the *Panthers* and *Cougars* since they have been around long enough to provide significant figures. Out of the 23 F9F ditchings there were 3 fatalities—11 came through uninjured.

Each of the fatals can be traced to failure or inability of the pilot to prepare for the ditching and to achieve a desirable ditching condition prior to touchdown. All three AARs read about the

Landplane Ditchings from 1 July 1954  
to 30 June 1959

	No. of Ditchings	No. of Personnel Involved	Fatalities	Percentage of Fatalities
Multi-engine recip.	21	111	8	7.1
Multi-engine jet	14	18	5	27.8
Single-engine recip.	132	200	10	5.0
Single-engine jet	53	55	15	26.0
Helo	63	185	6	3.2
<b>TOTALS</b>	<b>283</b>	<b>569</b>	<b>44</b>	<b>7.6</b>
Selected examples:				
P2V	4	37	0	0
S2F	7	24	3	12.5
AD	96	156	9	5.8
F3H	10	10	2	20.0
A3D	2	5	3	60.0
A4D	2	2	1	50.0
FJ	8	8	3	37.5
F4D	3	3	1	33.3
F9F	23	23	3	13.0
TV-2	3	5	2	40.0
F11F	3	3	2	66.7
F8U	1	1	1	100

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same, "The failure to reduce airspeed, lower the flaps or open the canopy before ditching indicates a lack of adherence to proper ditching procedures by the pilot."

"After a decision to ditch when in a power-off condition, pilots should lower flaps well in advance of touchdown, allowing extra time for the actuation of the flaps."

"He touched down with excessive speed due to misjudging his altitude above a glassy sea and the resulting impact caused complete structural failure."

"It is recommended that all pilots be given a thorough indoctrination in the ditching characteristics and procedures for the model aircraft they are flying."

As good as the F9F ditching record is, the real shocker is this—all three fatalities came in straight-wing versions, a dash two, a dash four and a dash five. There have been 14 ditchings in sweptwing *Cougars*—and not one fatality.

To get a little more current on aircraft type, examine the ditching history of the F3H. As of the end of March, 1960, there have been a total of 13 F3H ditchings. Three of these resulted in fatalities and three others caused no injuries.

Why three fatals? The answer turns out to be about the same as for the F9s. In the first case, the aircraft hit into an oncoming wave, slightly nose down. The second one touched down below stalling speed in an extremely nose-high attitude, about 30°—the nose fell through and the aircraft inverted. The third one hit right-wing-first and spun sharply to the right.

This figures out to 23% fatalities as compared with 12% fatalities out of the 41 F3H ejections occurring by the end of '59. But four of those ejections were below 1000 feet and three of the four were fatal—that's 75%. The use of the Martin-Baker Seat is beginning to change the picture. Two of the F3H M-B ejections have been successful, one from 2800 feet and one from 500 feet. The other one (there have been only three) was made at 10 feet with low airspeed and high rate of descent and was fatal.

Nobody is arguing with the flight manuals because there is no disagreement with them. The book for the F3H says, "Ditching the airplane should be the pilot's last choice. If ditching is unavoidable, proceed as follows: 1. Canopy—open. 2. External stores—jettison . . .", etc.

That's fine. Ejection is still the best bet so long as you are well within the envelope for the ejection system involved. But when you are too low or too slow or the seat won't shoot, the last choice is made—DITCH! *But don't do it with one hand on the stick and the other on the curtain handle.*

Continued next page

# How Can You Improve Your Chances?

In the excellent and authoritative text, Aircraft Emergency Procedures Over Water, OpNav Inst. 3730.4 (Prepared by USCG) the ditching problem is divided this way, "A successful plane ditching is dependent on three primary factors. In order of importance, they normally are: 1. Sea condition and wind. 2. Type of aircraft. 3. Skill and technique of pilot."

## Sea Condition and Wind

"If your safety officer has been on the ball—and a good one is worth his weight in uranium—you've both drilled from the start on the idea that nobody ever takes off over water without the thought of a possible ditching in mind. Primarily, a pilot is prepared to fly. Of course. He's also ready to

follow through with a *specific* course of action if something goes wrong and he has to make the quick-splasher."—*Ditching Sense* (1958)

You have probably spent hours committing that ejection checklist to memory—reduce airspeed, actuate emergency oxygen supply, dump cabin pressure, disconnect leads, assume proper posture, . . .

Don't give any less time and attention to the ditching checklist—canopy open, gear up, brakes in, flaps and slats extended, hook down, . . . A sloppily executed ditching can be almost as distressing as an ejection with the pins still in.

How many briefings have you attended which included ditching procedures and conditions? The pilot who is dribbled unceremoniously off the catapult into the pond does not generally compute a headwind component and the height and period of the primary swell system. But if 330 degrees

Sea Evaluation Chart

Beaufort Number	Velocity Knots	Sea Indications	Height of Waves, Ft.		direction of waves.
0	Calm	Like a mirror	0	8 34-40	Moderately high waves of greater length; edges of crests break into spindrift; foam blown in well marked streaks in the direction of the wind.
1	1-3	Ripples with the appearance of scales;	6in.		
2	4-6	Small wavelets; crests have glassy appearance and do not break.	1Ft.		
3	7-10	Large wavelets; crests begin to break. Foam of glassy appearance; few very scattered whitecaps.	2	9 41-47	High waves. Dense streaks of foam; sea begins to roll; spray affects visibility.
4	11-16	Small waves, becoming longer. Fairly frequent whitecaps.	5	10 48-55	Very high waves with overhanging crests; foam in great patches blown in dense white streaks. Whole surface of sea takes on a white appearance. Visibility is affected.
5	17-21	Moderate waves, taking a pronounced long foam; many whitecaps.	10		
6	22-27	Large waves begin to form; white foam crests are more extensive; some spray.	15		
7	28-33	Sea heaps up and white foam from breaking waves begins to be blown in streaks along the	20		

**NOTE:** The heights given for the wind-driven sea are approximate. The height depends on the length of time and steadiness with which the wind has blown, and the fetch. It should also be remembered that it is possible to have a heavy swell running in an area where there is little or no surface wind. Also, a heavy swell system may be obscured or hidden beneath a local wind-driven system.

OpNavInst. 3730.4



is the best ditching heading under the circumstances, why land 030 degrees if there is any time available for decision making?

A preliminary sea evaluation and selection of best ditching heading should be a part of every briefing session for overwater flight. It is then up to the pilot to reevaluate the sea and refigure best heading throughout the flight. He must be able to whip around to a predetermined heading automatically at the instant a ditching situation develops.

The pilot must first beat down his natural impulse to head into the wind for landing. Unless he is going to plunk it down in a sleepy lagoon, landing into the wind usually amounts to landing almost perpendicular to the major swell system—Face of Swell = Brick Wall.

In all winds up to 25 knots the major swell system should be used to determine the landing heading. The easiest touchdown will be made parallel to the major swell and on a crest (see diagram). This gives you two possible headings. Pick the one that comes closer to putting you into the wind.

If all this seems to be getting too simple, add one or more secondary swell systems. The effect of these smaller swells is to obscure or fill the troughs of the major system and to complicate the problem of heading selection.

The primary swell will show up most clearly at altitudes of 2000 feet or more. It is necessary to get lower, as low as 500 feet, in order to evaluate any secondary systems.

When you detect a minor swell which appears to be of sufficient height to warrant consideration, land parallel to the major swell (as usual) and down the minor swell. Hit the major on a crest and hit the minor on the backside just beyond a crest. *It may be necessary to accept a tailwind component to achieve this.*

In any case, **AVOID THE FACE OF ANY SWELL!** (See diagram)

When the winds are above 35 knots, you can generally forget the conversation about swell systems and point it into the wind. As you may have guessed, this is a sort of grab a hold and hang on situation. But it has been done and gotten away with.

Out of our five-year sample come these outstanding examples: An F3H-2M was ditched into the wind which was blowing about 35 knots and whipping up a wave height of 10 feet. The pilot blew open the canopy and climbed out easily, receiving only minor injuries. This was a quickie right off the cat and there was insufficient time to do anything except get the nose up and level the wings.

One F9F-8P was ditched into a 38 knot wind—sea state 5 (12-foot waves). His canopy was open and his attitude was perfect with about 5 degrees nose up and wings level. The aircraft went in following a bolter and was in the landing configuration. In this case the pilot received severe injuries but his survival was remarkable at that—this all happened *at night*.

If the winds are between 25 and 35 knots, back off and take another look. This setup will generally require a heading which compromises between wind and swell effects. A heading of 45 degrees out of the wind and at 45 degrees to the main swell system would be the usual resultant.

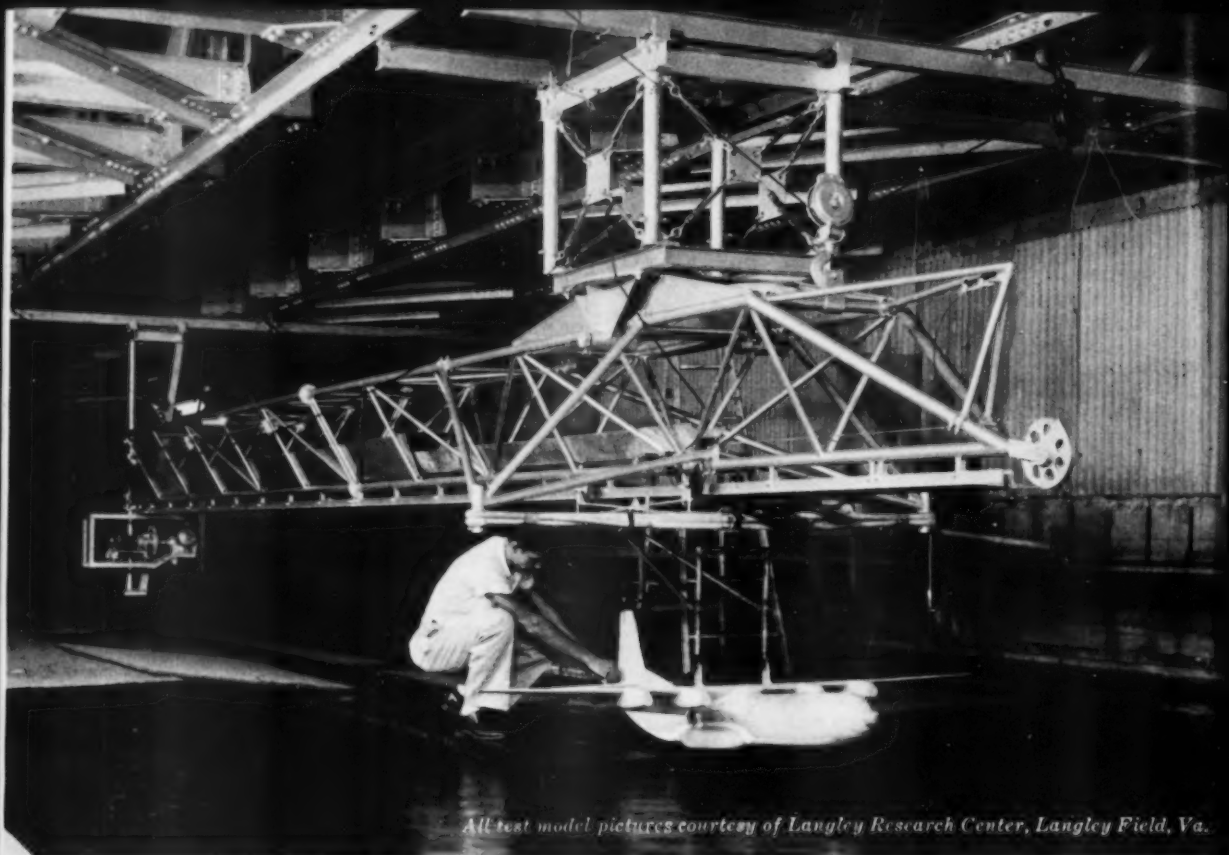
Whether ditching the biggest multifan or the hottest jet available, wind and sea conditions are the most important factors bearing on survival probability. Learn all you can about how best to turn these factors to your advantage (see Sea Evaluation Chart and Recommended Reading List).

#### Type of Aircraft

A pilot can get all sorts of valuable information on the appearance and the effect of the sea—he can bone up on emergency procedures and be a real savvy, confident soul. But once he has vaulted into the glue, there is precious little he can do to alter the airframe vehicle in which he will ride for at least this one hop.

"The pilot has no choice of the type aircraft he is forced to ditch. By knowing the characteristics of the aircraft, however, and its expected behavior on the water, certain steps can be taken to insure best ditching performance. Data on ditching characteristics of most aircraft are available from controlled tests on models or from studies of actual ditchings."—*OpNav Inst. 3730.4*

Much of the testing on scale models was accomplished by the hydrodynamics research division of NASA at the Langley Aeronautical Laboratory, 7



*All test model pictures courtesy of Langley Research Center, Langley Field, Va.*

Scale models were launched from a towing carriage or monorail so that they were free to glide onto the water at the desired landing attitude and speed.

Langley Field, Va. This division was closed in December of 1959 but not before they had completed numerous ditchings of dynamic aircraft models in one of their monster indoor tanks.

A summary of the results of these tests can be found in NASA Report 1347, 1958, prepared by Lloyd J. Fisher and Edward L. Hoffman. The report discusses ditching characteristics of many types of airframes in general terms and gives specific test results for several models, including FJ, P2V, F3D, R7V, R4Y, R5D and R6D.

Studies of the kind reported at Langley cannot begin to get to each specific aircraft type. But, they can come up with general conclusions which may be applicable in some degree to your aircraft. Here are some of those conclusions and some suggestions as to how to apply them to your particular ditching problem.

#### Wing

"From a ditching standpoint, the vertical location of the wing with respect to the fuselage is a compromise between having the wing low enough to provide buoyancy to help keep the airplane

afloat after ditching and having the wing high enough so that the landing flaps and engine installations do not seriously impair ditching behavior. It is generally considered that the most favorable position of the wing is slightly above the bottom of the fuselage or in a low midwing position.

"The thickness and size of the wings had little effect on ditching behavior other than the obvious effect on buoyancy. Sweptback and delta wings had little hydrodynamic influence on ditching but they did have aerodynamic influence on handling and landing characteristics."—NASA Rep. 1347

Considering for a moment only the effect of wing position and shape, it may be expected that aircraft with a high or shoulder wing will be easier to put on the water in good shape than will low wing aircraft. This is true because those parts of the airfoil which are helpful in controlling attitude at touchdown and for some portion of the runout are less subject to impact damage if they are located high on the fuselage (F8U, S2F, A3D, A3J).

On the minus side of the ledger though, the

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high wing aircraft will receive no flotation help from wing buoyancy. This will result in a more rapidly submerged fuselage and less available time for crew escape. The low wing aircraft then is best from the standpoint of floating and escape time but is more likely to lose such handy items as flaps, slats and even whole wings on impact (FJ, F4H, AD, A4D, R4D, R4Y, R6D, R7V, WV, TV, T2V, T-28).

The best compromise in wing placement throughout the ditching sequence is the midwing or low midwing design. This arrangement is most likely to provide fair retention of the wing and its devices and some planing surface without too great a sacrifice in flotation (F9F, F2H, F3H, F3D, F4D, P2V). *Neglecting other factors*, the ditching histories of these types indicate that the compromise has been helpful.

The F11F is a high midwing but it is a poor ditcher due to other factors which will be discussed.

#### Aircraft Size

It is no secret that big airplanes experience less violent gyrations during ditching than small airplanes. But the built-in strength of modern fighter and attack aircraft provides some compensation.

"Other factors being equal, the larger the aircraft, the better are its ditching characteristics. Fighter aircraft, due to their higher landing speeds and smaller size, often react violently on ditching. However, due to their strong fuselage and cockpit, as well as the shoulder harness worn by the pilot, the survival rate is high."—*OpNav Inst. 3730.4*

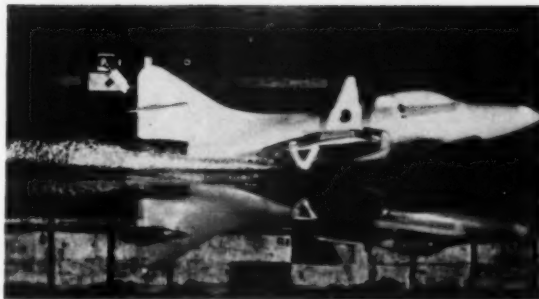
#### Flaps

This one is really easy. Any time you can reduce landing speed, deceleration forces, impact forces and length of runout, do it. The flaps will cause some diving tendency if they are still hanging on during the water run but, put them down full and early.

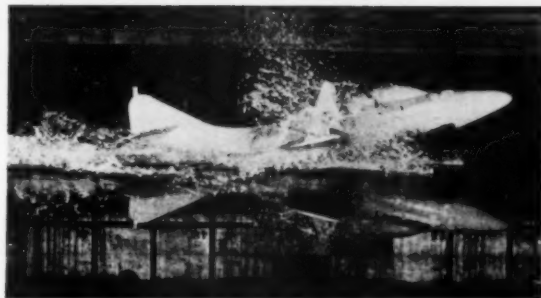
These same general rules apply to all high lift devices whether leading or trailing edge type. The more of them you have, the better off you are.

There is one exception. The best position for the variable incidence wing when ditching the F8U is down. This will permit a higher nose position at touchdown and will keep the chin scoop out of the water longer which is vital. So leave the wing down and expend the droop pneumatically. Landing speed in this configuration should be about 145 knots.

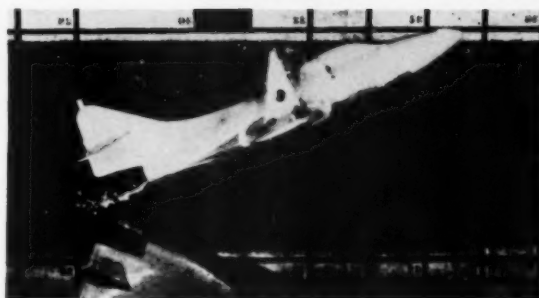
If the aircraft is already in the landing or takeoff configuration (wing up) an instant before ditching, don't change it. Lowering the wing in



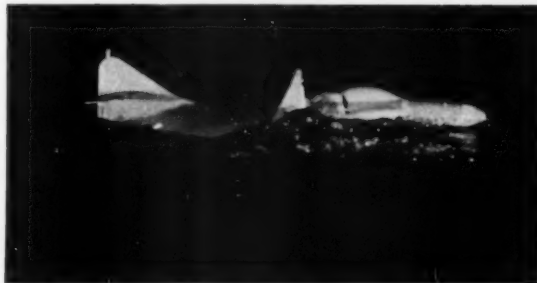
Near contact



210 feet



370 feet



615 feet

This Panther landed 8 degrees nose up at 114.2 knots with a peak deceleration of 3 gs during the 760-foot runout.

this situation will only introduce an intolerably high sink rate with insufficient time to check it.

#### Landing Gear

This is the other easy one. When landing upon the water, landing gear is bad for you. Decelerative forces and diving tendency are considerably higher with gear down. If you have enough time and any choice, get it up.

#### Hook

A lowered arresting hook can provide an important split-second warning. This is especially so under conditions where height perception is difficult such as at night or over a glassy surface.

Some careful preplanning must be present to ensure that proper use will be made of the warning. There is a strong urge to haul the nose up when the ticking or digging of the hook is felt. *Don't do it!*

The landing attitude should be established well before the hook begins to dig. Leave the attitude alone—hold what you've got. Horsing back at this point is likely to shoot you back into the air with zilch airspeed a moment later when you need it.

Digging of the hook is the signal for throttle OFF, engine master switch OFF and d-c power

switch OFF. It doesn't mean unstrap and climb out. Save that part of the procedure for the instant when *all* forward motion has stopped—and that is most likely to be after two or three distinct jolts.

#### Other Factors

"Fighter airplanes usually have jet engines located within the fuselage; therefore, the location of the air intake is the most important feature of such installations. The inlets may cause detrimental behavior when a ditching is made at a flat enough attitude to get them into the water at high speeds. Usually, however, an airplane can be landed so that the inlets are held clear of the water until a fairly slow speed is reached."—*NASA Rep. 1347*

And so we have come to what is probably the knottiest design problem affecting ditching characteristics. This subject includes the whole family of things that bulge out of airplanes—intakes, jet pods, stores, external tanks, radomes, props and all manner of sundry protuberances.

There are some general principles which will give you some idea of what you can expect these various lumps to do to the ditching performance of your aircraft:

► Jet intakes built into the wing roots have

The chin scoop on the Crusader can be held out of the water longer because of its extreme forward position.



very little effect on dynamic behavior and will have little influence on structural damage (F9F-6 to 8, F2H, F4D).

► Intakes mounted on the under side of the fuselage when located well forward as on the F8U will not produce any unusual diving tendency. Such an intake will, however, cause a very high deceleration if permitted to contact the water early in the runout while speed is still high. For this

out at near right angles to the fuselage. This gives the long thin nose section the look of being stranded out in front with the pilot strapped to the end of it.

"The breaking up of the fragile nose section in front of the cockpit provides the greatest danger to the pilot."—AAR, F11F.

It is not intended to be critical of aircraft design based upon the unusual demands imposed in the ditching maneuver. Aircraft are built to travel through air and not water. All that can be done is to discover what the behavior of your aircraft is likely to be during ditching and to learn some of the ways in which the adverse effects can be kept to a minimum by the pilot—more about this under Pilot Technique.

► A variety of bulbous shapes are affixed in one way or another to the underside of many of our current aircraft. These range from droppable tanks to not droppable radomes. Each has some contribution to make to the ditching picture.

Here are the rules which apply generally to the bottom bumps. "Protuberances under the wing or the fuselage of an airplane may cause undesirable ditching behavior and high longitudinal decelerations. Protuberances located rearward of the center of gravity are the most undesirable and may cause diving. Radiators projecting below the fuse-



reason, the F8U should be ditched with a higher nose position than is normal for most aircraft.

The same principles apply to aircraft with a nose mounted intake such as the FJ series. The problem is not quite as critical because of the higher position of the intake. The best attitude for ditching the FJ is about 14 degrees nose up.

► Mounting of jet intakes along the side of the fuselage seems to be gaining popularity in aircraft design (F11F, F3H, F4H, A4D, A3J, TV-2, T2V). This is the feature which has much to do with separating the mean ditchers from the meaner ones.

These bulges are all undesirable in the water due to the increase in longitudinal deceleration which they produce upon entry. The worst ones are those that are the fattest, the lowest and the farthest aft.

Compare the intakes on the F3H and the F11F. The F3H intakes conform smoothly to the shape of the fuselage beginning at about the position of the pilot. There is no sudden sharp protrusion and the fairing even gives the appearance of lending additional strength and substance to the critical nose section.

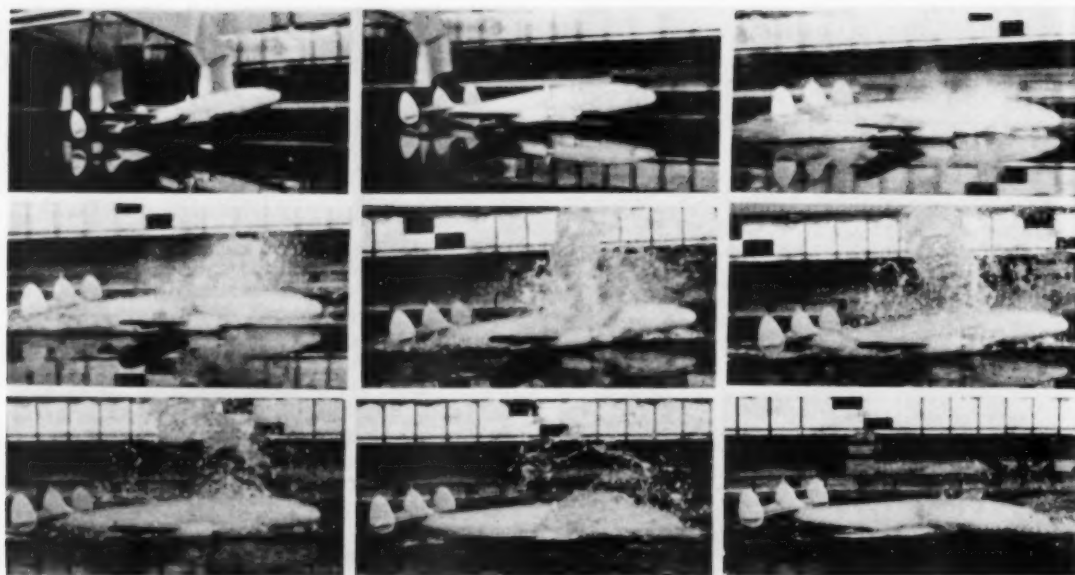
In contrast, the F11F scoops happen all of a sudden slightly aft of the pilot. They jut straight



large rearward of the center of gravity have caused dives.

"Radiators under the nose have caused violent ditching behavior and high decelerations." (F8U chin scoop, a similar example.)—NASA Rep. 1347

There is only one F8U ditching on record. Although the pilot and helo crewman were lost during the rescue phase, the actual ditching was suc-



Twelve-degrees nose-up is a little too high in the Connie and the deeper run will push the g-meter up to about 4—runout was 250 feet.

cessful. The aircraft remained intact. The pilot received only minor injuries in the process of landing and abandoning the aircraft but then became hopelessly entangled in the chute shroud lines.

The extreme forward position of the chin scoop on the F8U is an advantage. If it were any farther aft it would be much more difficult to hold it out of the water until some of the forward speed is dissipated. The F8U cockpit and nose area are quite rugged but not so rugged as to withstand the dive which would result if the aircraft were landed in a flat or nose low attitude. Touchdown should be made with the nose as high as possible without getting into an unacceptably high sink rate—probably on the order of 14 degrees. The nose should then be held up during the runout.

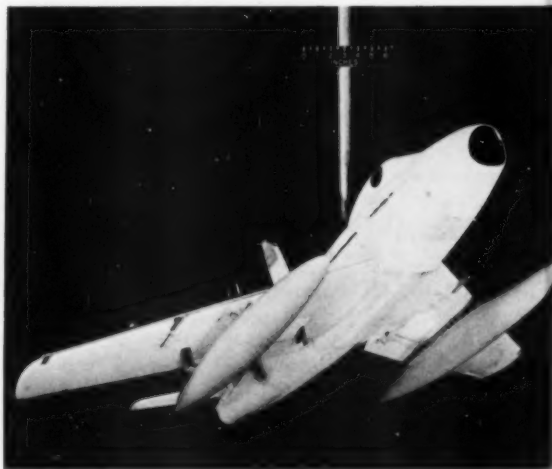
"Radar housings placed forward of the center of gravity generally have caused no diving or other violent motions when tested on models."—NASA Report 1347

Note that the radome on the P2V is located well forward of the center of gravity. In this position, the housing will not produce any adverse effects during touchdown or runout. In fact, the relatively weak structure will provide some added cushioning by absorbing energy in vertical deceleration.

12 The radomes on the WV aircraft are located right about at the center of gravity. Such stream-

lined shapes create a suction and will produce some slight diving tendency at the beginning of runout. If held up by slight back pressure on the yoke, this tendency will be overcome. Again, if the sink rate is a little high, the fairing will probably collapse and provide some energy absorption.

External stores including underslung drop tanks should be jettisoned prior to ditching. Well streamlined combat type external fuel tanks such as



those carried on the FJ will set up a suction force upon contact with the water. This creates an immediate diving movement and will cause the nose intake to enter the water more quickly.

Any stores still attached to the aircraft will increase the total hydrodynamic resistance and thus produce a higher maximum longitudinal deceleration. It is also important to get rid of the additional weight in order that minimum vertical and forward speeds can be obtained at best nose position.

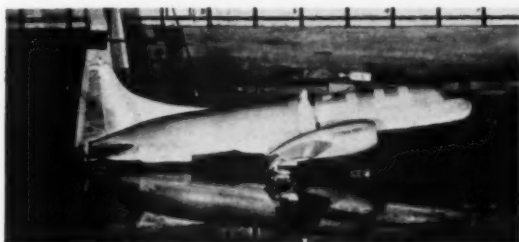
Wingtip tanks should be emptied and retained. They will give a little added buoyancy in the water and a little more time for the pilot to escape. Such tanks are not detrimental to the ditching behavior of the aircraft. However, jettisonable wingtip tanks should be dropped if they can't be emptied.

In a prop job with power available, it is highly desirable to use that power to achieve a minimum sink rate at the instant of hook-grab or touch-down. The S2F appears to be an exception to this rule due to the uncomfortable proximity of the props to the crew space and the tendency of the props to shatter and turn into shrapnel. This has led to a widespread doctrine calling for the feathering of both props just before the flare. This procedure is also recommended in the flight manual.

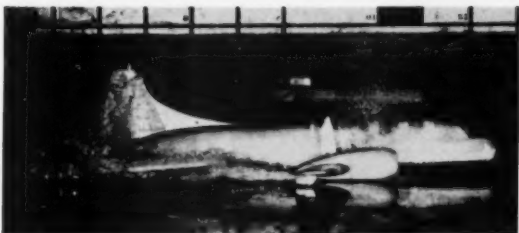
There has been one highly successful S2F ditching accomplished without feathering the props (see "Painless," page 22). The decision to feather or not to feather will have to be made in the light of the conditions in each case. One factor which

and broken off during ditching. Bomber types are the worst because of the comparative weakness of the fuselage in the vicinity of the bomb-bay doors. So, if there is any room for moving crew and passengers, first fill the ditching stations which are the highest (top deck) and farthest forward.

Some P5M commanders have gone so far as to place all hands on the flight deck even in excess of



Near contact



50 feet



150 feet

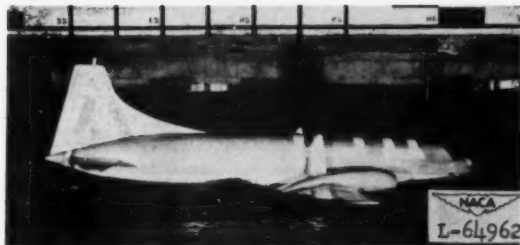
the pilot should consider is whether sea conditions are such that he will need some power in order to land at a precise point. Feathered props are not going to provide much consolation if the aircraft ends up hitting a "brick wall."

► Ditching stations are not always a matter of choice. Even in the biggest transports and patrol planes, there are only so many places where people can hide.

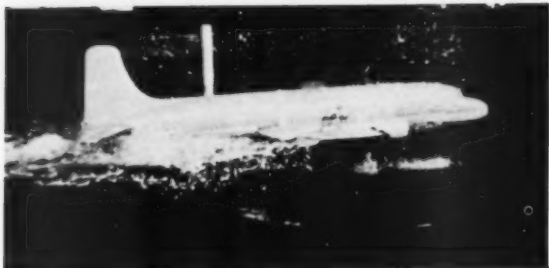
There is a considerable danger that the after section of a large aircraft will be severely damaged

and broken off during ditching. Bomber types are the worst because of the comparative weakness of the fuselage in the vicinity of the bomb-bay doors. So, if there is any room for moving crew and passengers, first fill the ditching stations which are the highest (top deck) and farthest forward.

Some P5M commanders have gone so far as to place all hands on the flight deck even in excess of



300 feet



Attitude is all-important in any type aircraft—in the R5D and R6D 12 degrees nose up is best and results in a gentle run . . .

the number of available ditching stations. This is accomplished by having the extras sit on the deck toboggan fashion facing aft. There is evidence to indicate that it is better to have people rattling around loose on the flight deck than to have them strapped down in prescribed ditching positions in the after station—at least in the P5M. The only limiting factors seem to be floor space and the forward travel of the center of gravity.

NASA Report 1347 summing up on design problems states, "Performance requirements and the relatively low frequency of emergency landings even in wartime make it unlikely that airplanes will ever be designed specifically for 'safe' ditchings. It appears possible, however, to reduce the hazards by some attention to the effects of the design parameters. This possibility together with the establishment of proper approach procedures, provision of adequate means of escape, and early rescue remain the most effective means of increasing survival rates in future ditchings."

#### Pilot Technique

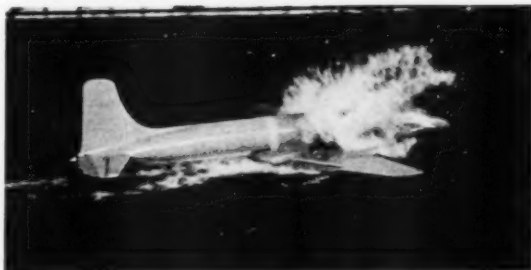
This may sound like an entirely new topic but it really isn't. The skill and technique of the pilot in effecting the water landing are only reflections of his familiarity with the several considerations

we have discussed under sea and wind conditions and design effects.

"In a landplane ditching, probably the least important of the three controlling factors *after touchdown* (sea, type aircraft, and skill of pilot) is the skill of the pilot. The pilot's task is essentially to set the aircraft down on a proper heading in the right spot at the best combination of attitude and speed. The importance of a low touchdown speed must be appreciated. The energy of the aircraft, which must be dissipated during the runout, is proportional to the square of the speed. Touchdown should be at the *lowest speed* and rate of descent which permit safe handling and optimum nose-up attitude on impact."—*OpNav Inst. 3730.4*

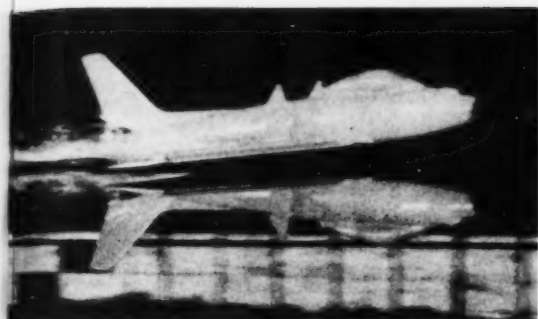
The key words in that paragraph are, "optimum nose-up attitude." Notice that even speed, important as it is, becomes subordinate to attitude. After all, how much worse is it to have a head-on collision at 130 knots than at 120 knots?

Forgetting everything else, the best nose position for ditching is very slightly nose high—some-

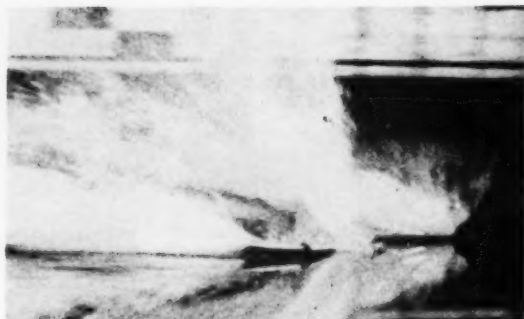


thing like 5 to 8 degrees. And this would be fine for all aircraft if you could keep the nose there during runout. We have already seen why this can't be done in several aircraft such as the F11F, FJ, F8U, A3J, F4H and others.

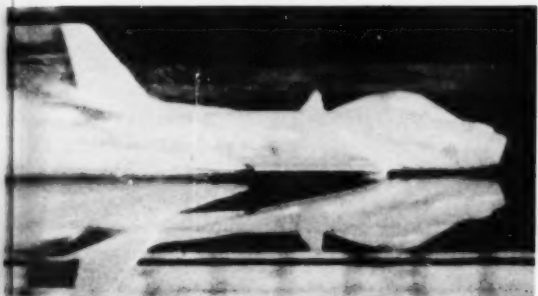
The relatively good ditching records of the P2V, S2F, F3H and AD are largely attributable to the fact that these aircraft can be ditched in something close to an optimum attitude.



Contact



170 feet



90 feet



190 feet

... but ditching the FJ with only 4 degrees nose up instead of the desired 14 degrees leads to a much too fast 132 knots at contact followed by a violent dive and disaster.

With a process of elimination the paramount importance of nose position becomes obvious. Landing with the nose down leads to an immediate dive and disastrous impact loads. When the aircraft is landed with the nose too high, the afterbody digs in hard and the nose is slammed down *a la* hammerhead stall. No nose section is built to take this kind of punishment and off it comes.

One consequence of this broken nose business has been experienced in large aircraft with a radome nose. When the nose breaks water surges back through the fuselage. The hydraulic ram effect is capable of blowing off the entire after section of the aircraft.

Recommended nose position is not always pinned down to an exact number of degrees. The flight manual may just use a general statement such as "nose high," "slightly nose high" or "normal landing attitude."

Some recommended figures which are available may give you an idea of what to expect: JD—8°; P2V—6°; P4M—7°; R4Y—9°; A3D—6-8°; FJ—14°; F3D—8°; R7V—9°; WV—9°; R4Q—12°; R5D—12°; R6D—12°; and the Boeing 707—12°.

Let's examine a few ditching accounts with a view toward evaluating pilot techniques which have already been tried.

"The old rules, maintain flying speed and fly it all the way into the water, came to my mind, so I let the nose drop to avoid stalling. Almost instantly after doing this, the aircraft struck the water in what I believe to be wings level, almost



flat, attitude. The shock was not as severe as I expected. I believe that the nose went under, came up, and went under again because I saw green (sea water), daylight and green again in that order."—A4D AAR (no injury)

"When it was apparent I would not make the runway, I turned slightly to the left to avoid a breakwater and touched down at about 115 to 120 knots with wheels down and canopy closed and with what I believe was full flaps. I got a slight warning on the stick shaker. Impact was much more gentle than anticipated. After the aircraft



Hard to believe?—the pilot sat calmly on the canopy waiting for a boat to come and get him.

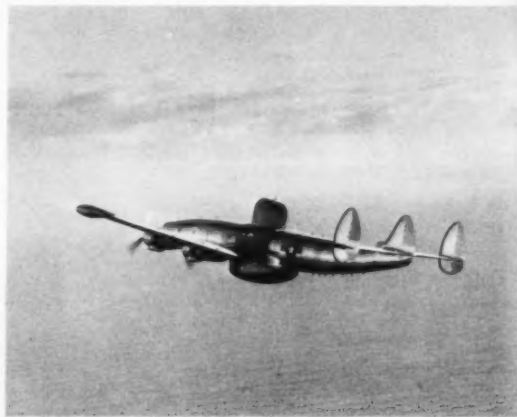
stopped I opened the canopy, disconnected the chute, oxygen and radio equipment. I released the pararaft, inflated my mae west and sat on the canopy for about six or seven minutes until the plane sank."—F2H AAR (no injury)

"The helicopter continued to lose power. Altitude and airspeed were lost and contact with the water was made with zero ground speed in a level attitude. As the wheels entered the water, the



pilot turned off the magneto switch and applied the rotor brake. The helicopter stayed upright for approximately five seconds and then rolled to the left. All three personnel were picked up immediately by other squadron helicopters in the area."—HSS-1 AAR (no injuries)

"After the decision was made to ditch the aircraft, the pilot technique employed was of the highest order as evidenced by the fact that the entire crew (18) escaped with only extremely minor injuries to two members. The decision was made at 1500 feet with No. 1 and 4 propellers feathered. The pilot called for 60 percent flaps and landing lights. He elected to land on a course that would place the plane parallel to the swells. The wind was calm. The moon was approximately overhead. Descent was made from 1200 feet with 2200 rpm and 32" MAP at 300 feet per minute and the airspeed was held at 145 knots. As the aircraft neared the water the pilot concentrated on the flight instruments and maintained a 10-degree nose-high attitude, wings level with a 75 feet per minute rate of descent. When the radome contacted the water the pilot added power slightly keeping the nose-high attitude. The power was then gradually reduced and the aircraft came to rest in the water. All crew members were at their ditching stations and exited without mishap."—WV-3 AAR



"The pilot concentrated on keeping the wings level, maintaining a heading of 145 degrees (parallel to the swells) and establishing a rate of descent of 200 feet per minute with an airspeed of approximately 125 knots. As the gear had been lowered to prevent a tire explosion due to the fire, the pilot elected to leave the gear in the down position and since the aircraft seemed well under control, it was decided not to disturb the attitude of the aircraft by lowering the flaps. The air-



If anyone should be concerned about having to ditch, it is the Navy pilot—nearly his entire mission keeps him over water.

craft was ditched with gear down, flaps up, power on the port engine, jets idling and in a slightly nose-high attitude."—P2V-5F AAR (minor injuries to two occupants).

The moral is again clear—attitude is more important than anything.

"To the best knowledge of this command there have been three F11F-1 ditchings. The pilot involved in this accident was the only one of the three to survive. The fact that the aircraft remained intact after impact is attributed to: (1) the nose-high attitude; (2) the swerving of the aircraft to port which caused the body of the aircraft instead of the nose section to sustain the force of the impact. The collision of the aircraft with the water was made in a nose-high attitude, landing gear and arresting hook down, flaps and slats extended and in full combat power. The port wheel sheared on impact and the aircraft swerved to port. The aircraft remained intact thus enabling the pilot to escape without injury. The breaking up of the fragile nose section in front of the cockpit provides the greatest danger to the pilot. It may be desirable to contact the water in

a yawed attitude (wings level, nose high) by the application of full rudder and/or full directional trim. Contacting the water in a slightly wing-down, nose-high attitude may also be helpful to the safety of the pilot. Comments by other interested units concerning ditching technique in the F11F-1 are invited."—F11F AAR

These may sound like rather desperate measures. But the fact exists that the use of conventional ditching techniques in the F11F has been entirely unsatisfactory. In such a case, imagination and inventiveness are all that remain as alternatives to zero or low altitude ejection.

Here is one final AAR quote and it may just be the granddaddy of all split-second, precision, high performance ditchings.

"At the 45-degree position the pilot experienced a series of engine explosions. These were followed by a large fire trailing from the tailpipe and loss of power. The pilot attempted an afterburner lightoff which was not successful. He then raised his landing gear, lowered the emergency ram air pump, lowered his seat, made a successful night

instrument ditching and was picked up by the destroyer plane guard several minutes later. The aircraft remained intact during the successful ditching with the exception of the nose (radar covering) which broke off and floated for several seconds. The aircraft stayed afloat for an estimated 30-45 seconds and then sank in 108 fathoms of water. The pilot firmly believes, as does this board, that his successful night ditching and survival are directly attributable to his decision to go on instruments and fly the plane until it hit the water. The pilot did a remarkable job in preparing his aircraft for ditching after encountering an emergency at such a low altitude. Panic or indecision would have been disastrous."—F3H-2M AAR (no injury)

The pilot of that one got so carried away with the happy ending to the tale that he went just a trifle overboard in his statement. "Carrying the helmet, trying to stay afloat, looking for the flash-

light were beginning to become more than difficult. So, with much regret, I let the helmet go. It was an Air Force P-4 type helmet of which I was justly proud. I will say at this time, if in the future, I should ever have a choice whether to eject or ditch in the F3H, I would elect the latter. The F3H has good ditching characteristics; it stays together on impact and it remains afloat long enough to afford the pilot ample time to free himself from the aircraft."

It is always tough to find fault with success and under these particular circumstances we won't. But, the sweeping decision to ditch the next time without regard for conditions is not recommended.

#### Conclusion

Most flight manuals are quite complete on the subject of ditching with respect to aircraft configuration, ditching stations and abandonment. They are quick to emphasize, especially for high

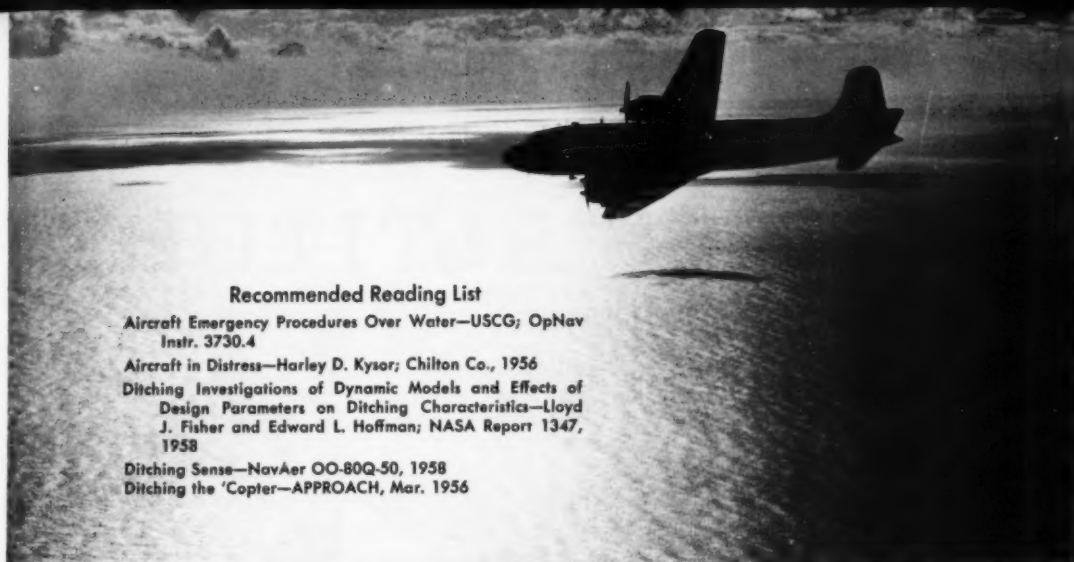


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### Recommended Reading List

Aircraft Emergency Procedures Over Water—USCG; OpNav Instr. 3730.4

Aircraft in Distress—Harley D. Kysor; Chilton Co., 1956

Ditching Investigations of Dynamic Models and Effects of Design Parameters on Ditching Characteristics—Lloyd J. Fisher and Edward L. Hoffman; NASA Report 1347, 1958

Ditching Sense—NavAer OO-80Q-50, 1958

Ditching the 'Copter—APPROACH, Mar. 1956

performance aircraft, that ditching is an evolution to be avoided with some determination. But, with few exceptions, the manuals offer woefully little information on how to get the buggy on the water in some sort of recognizable shape. Hence, this article.

One of the happy exceptions is the A3D Flight Manual. It contains some real fine rules for ditching preparation and execution—some specific for the A3D, some of general interest.

► "In many cases little time will be available, and the pilot must be able to make a quick assessment of the sea and wind conditions under which he must land and to establish the best possible approach under those conditions.

► "The factors that affect a water landing are the same as those affecting a normal landing; however, tolerances are far more critical and must be closely maintained in order to hold to a minimum the extremely high impact forces and pressures encountered in a water landing.

► "The angle of descent at touchdown is the most important variable the pilot can control. A rate of descent of 100 feet per minute is recom-

mended and should not be exceeded under any circumstances.

► "This attitude (6-8 degrees nose up) has the important advantage of allowing as little fuselage area as possible to be at a zero attitude during the first contact with the water. In smooth water, or when power is available, this nose-high attitude may be reduced slightly if the rate of descent is also decreased.

► "It is generally best to land at as slow an airspeed as possible relative to the water. *A low speed, however, must not be obtained at the expense of increasing the angle of descent or of unduly increasing the ditching attitude, and under no circumstances should the airplane be stalled in.*

► "Conditions permitting, bail-out is recommended in preference to ditching."

*Conditions permitting*—aye, there's the hooker! Conditions permitting, return to base. Conditions permitting, make a flameout approach. Conditions permitting, eject. Or for that matter, conditions permitting, take it back and get a new one!

And when conditions don't permit, what then? DITCH—and when you ditch, do it right. ●

The extensive research and writing involved in this article were accomplished by Managing Editor LCDR David M. Hume, USN. Designated a Naval Aviator in May 1945, he then flew PBMs in VPMS-9 and later flew the MARS as a First Pilot in VR-2. He served on the USS TICONDEROGA as ACIC Officer, followed by a tour in VP-56 where he was the Aviation Safety Officer. LCDR Hume joined the APPROACH staff in 1959 and is a graduate of the Aviation Safety Officers Course at USC.



# USELESS ALTITUDE

Three previous hops had logged nearly seven hours of slow time on an AD engine run-in. A fourth flight was scheduled to complete the required 10 hours slow time and the pilot, accompanied by an escort plane, was launched from the carrier at mid-morning. Weather was 1500 scattered with 10 miles visibility. The two ADs joined up and commenced orbiting less than 15 miles from the ship.

Squadron policy required slow time flights to be made in VFR weather at 5000 feet altitude. This was to permit adequate altitude to control the aircraft in the event of engine failure and to give the pilot the option of bailing out if fire or other emer-

gencies should occur. In order to stay VFR under the cloud bases, the ADs climbed only to 1000 feet and began circling. There were no reported details on whether a thickening sky cover prevented climbing to altitude or if it was a pilot decision in order to keep the carrier in sight.

For an hour and a half the two pilots churned around in loose formation without any transmissions being exchanged and with no sign of difficulty being experienced with the slow-time aircraft. Just a dull but necessary part of aviation. Then something went wrong.

"We had just completed a turn outbound from the ship," the es-

cort pilot said, "and I had slid out to my loose wing position and was watching the aircraft ahead. The aircraft's nose came up abruptly and the plane snapped over on the left wing. The nose fell through and it completed almost 270 degrees of roll when it hit the water with the nose just coming up past the vertical position. Before the splashed water had settled the plane was out of sight.

"I immediately called the ship . . . and continued to orbit the spot until the helicopters and boats arrived at the scene . . . I considered him to be a superior pilot and I don't have any idea what caused the accident."



Unfortunately, no one else was able to determine what caused the accident. The extra altitude which was prescribed to prevent just such things as this was missing; and so the accident board was limited to maintenance and flight records plus the memories of the pilots who flew the earlier hops after the engine change. One item of significance which was uncovered was the omission of a required carbon-monoxide test following the engine change.

The fact that a CO test was not conducted could have been a contributing factor; however, the fact that three previous flights had been conducted, without trouble, two of which were twice the duration of the fatal flight, does not support this as a contributing cause. Carbon-monoxide entering the cockpit through a leaking ventilation duct, firewall fissure, or improperly fitted canopy could have physically incapacitated the pilot but such a leakage could develop at any time.

Engagement of the auto-pilot prior to proper warm-up could cause the aircraft to go out of control momentarily. The AD had no history of previous auto-pilot malfunction though a chance malfunction at this low altitude, coupled with momentary pilot confusion, could have been responsible for the loss of control.

Both the accident report and this account of the accident must necessarily fade away with nothing stronger than speculations or possibilities. An old universal rule-of-thumb might well be modified to fit the circumstances of this accident: "On a test hop or slow-time flight one of the most useless things in the world is the altitude above you..."

**H**AIRY TALE — Bird strikes have not always been a problem to pilots. It took a few years after Kitty Hawk to build a machine that could even keep up with a young migrating Mallard. Times change. Nowadays airplanes move so fast the birds can't dodge. And it's hard to find a place where there isn't a

### Terrified

How does it feel to be in a midair collision? What happens in those brief seconds before impact? Identical situations produce different responses among individuals but this pilot remembered his midair as an interval when he was unable to react in the short time between "recognition of danger" and impact.

"I saw him suddenly appear level along my starboard side on an approximate parallel course with his port wing under my aircraft.

"I stared utterly transfixed and terrified with no doubt in my mind that we would collide. I knew that I wanted to pull away and up to the left but don't know whether any action was effected before impact.

"The aircraft continued close aboard my starboard side descending gradually and crossing from starboard aft to port forward. I saw the port side of his vertical stabilizer strike the starboard side of my nose section, ripping off about four feet of it in a shower of debris. I estimate all this took place in about three to four seconds."

Both aircraft remained flyable and the pilots diverted to safe landings ashore.

danger of a bird strike (the north pole maybe, but who wants to go there).

Altitude does not provide absolute sanctuary for the pilot; not too long ago a bird strike was reported at 18 thousand feet. This is the exception of course as reasonable birds prefer lower altitudes. The number of bashed birds on Sandblower missions is evidence of this. Birds sometimes stray from their accustomed habitats too. Several years ago an Air Force transport landing at a Kansas Field plowed into a flock of *seagulls* who had diverted from their home waters because of bad weather (got 65 of the varmints too).

The one thing you could always depend on was not running into a bird at night—having more sense than people give them credit for, they RON when the sun goes down and pass the hours doing whatever birds do at night. That is, except for owls who are an oddball bunch anyway and stay down close to their work hunting any-mice. So anyway you looked at it, the night skies generally belong to aviators.

Now with a report on what happened to an SNB near Cubi Point, Philippines, the aviators night supremacy may be challenged. The *Beech* was cruising straight and level at 2000 feet, 130 knots, during the hours of darkness when both pilots noted a bump as if something had struck the aircraft.

After landing a thorough post-flight inspection revealed an indentation on the leading edge of the starboard wing where the wingtip joins the wing. Several strands of dark brown hair were found imbedded around screw heads that secure the tip to the wing. It is suspected that a large *bat* was encountered.



## PAINLESS

**W**HEN the port engine started galloping, the S2F was at about 900 feet and holding a right-wing position. The pilot broke away from the leader and ran through single-engine procedure—rudder assist ON, props FULL INCREASE, throttles to FULL POWER and mixtures RICH.

The port engine responded with faster and harder galloping—mixture to IDLE CUT-OFF, fuel selector OFF, hit the port feather button. It now turns out that the oil pressure on the sick engine is off to about zero and that said engine is not about to feather now or any time soon.

Anyhow, the upshot of the whole thing is that the pilot decided to ditch (very smart) which he did just off-shore near Oceanside in broad daylight. All hands emerged uninjured and the aircraft received minor damage (later strike due to immersion and salvage).

This very neat job was turned in by Lt. (jg) C. G. Chisholm, VS-38. The next thing he did was to plunk himself down in dry surroundings and fire off a letter to the Aviation Safety Center. This letter contains some very fine technique ideas on the delicate business of ditching an S2F:

"This forced ditching was caused by port engine failure, inability to feather the engine and extreme vibration of the engine and propeller with emphatic indications that the propeller was about to separate from the aircraft any second. The malfunction occurred at 900 feet altitude while joined starboard on a lead S2F, in a two-plane formation.

"The aircraft was ditched 90 degrees to the wind (which was a right crosswind) parallel to

4- or 5-foot ground swells, 1200 yards from the beach. The configuration was gear UP, flaps full DOWN, hook DOWN, rudder assist ON, port engine windmilling with extreme vibrations, power on the starboard engine, and an airspeed of 90 knots. The aircraft was controlled from the right seat.

"Vibrations ceased following the securing of the mixture and the gas, but not being able to feather the port engine, we were faced with the idea that we might have to ditch. Once the vibrations commenced again, seizure of the propeller seemed imminent and we were faced with ditching the aircraft as soon as possible.

"The order to ditch was given, seat belts were tightened and forward hatches were opened. The crewman released the radar hatch prior to the order being given but no additional control difficulty was noted. The hook was down and flaps were lowered full down just prior to reaching ground effect at approximately 50 feet. It was necessary to reduce power to continue descent. Power was reduced even more, the airspeed decreased to 90 knots and I felt the hook touch water. The nose was raised to an estimated 5 degrees above the horizon and approximately one to two seconds after feeling the hook "grab" the aircraft struck the water and seemed to stop almost immediately. I found myself amidst a tremendous surge of water which seemed to be coming from everywhere. A possible explanation of this is that the nose cone was probably lost on impact allowing water to enter from the relatively large opening. The nose cone was never recovered.

"I would like to say that just prior to impact I remember taking a deep breath which I realized was wrong from previous dilbert dunker experience (I have been through the dunker six times). This breath was knocked out of me on impact and I felt slightly, but not uncomfortably, short of air. My first impression was that the aircraft had flipped and was on its back and everything appeared green. The visor on my APH-5 hardhat was down which accounted for the green appearance. The APH-5 equipped with Hardman fittings and chincup remained on my head throughout the ordeal as did the copilot's and crewman's. I missed my lap belt the first try but got it on the second and stood up reaching for my PK-2 lanyard which was draped over my knee on impact. I believe I got a hold on it and gave several sharp tugs and it didn't budge so I thought 'Hell with this' and exited through the overhead hatch. I came to the surface simultaneously with coming out of the hatch. Some difficulty was experienced with pulling the toggles on the mae west due to a 'soapy' slippery feeling of my gloves (yellow leather). I did get the right side inflated and then removed my gloves and inflated the left toggle. I would like to note that although the water temperature was approximately 64° it felt quite warm to me as well as the others.

"The impact was observed by the aircraft in company with us and they estimated that our aircraft traveled a relatively short distance after striking the water with a large amount of spray. I would compare the impact to be very similar to that of a dilbert dunker simulator. This may be the reason for my thinking that the aircraft had flipped over. Upon recovery of the aircraft the accelerometer reading was 9 G's positive and 2 G's negative. Personally, I would compare the impact force of about one and one-half or two times that of an arrested landing.

"None of us were able to remove our PK-2 raft from the aircraft. It was known the helicopters were enroute prior to ditching and no thought was given to removing the Mk-4. We were only in the the water for 10 minutes before being rescued by the helicopters.

"The aircraft was floating wings-level about 35 degrees nose down, with the water level being just above the forward hatches extending aft to the radome with the entire empennage above water. It floated for about four minutes. For about 30 seconds it appeared as if it were going to float indefinitely and then we could see it was sinking slowly nose first. It went beneath the surface tail last with the longitudinal axis of the aircraft vertical. The aircraft was later found right side up on the bottom in 35 feet of water and recovered.

"Feathering of both propellers prior to ditching

is recommended by our squadron emergency procedures handbook when attempting a normal ditching. This procedure has been the subject of arguments both pro and con by squadron pilots. In this situation we were unable to feather the port engine and it was not considered feasible to feather the starboard engine for several reasons:

"First since we were unable to feather the port engine the trim change encountered just prior to contact with the water would have been excessive.

"Second, control of the aircraft was very difficult due to extreme vibration of the port engine and propeller.

"Third, and probably the most vivid in mind prior to ditching, was that of the possibility of the aircraft breaking up from twisting induced by one feathered and one unfeathered propeller as the aircraft entered the water. The fact that the propellers were not feathered may account somewhat for our relatively short travel after contact with the water. The propellers were bent in a gentle arc at about seven to ten inches from the tips.

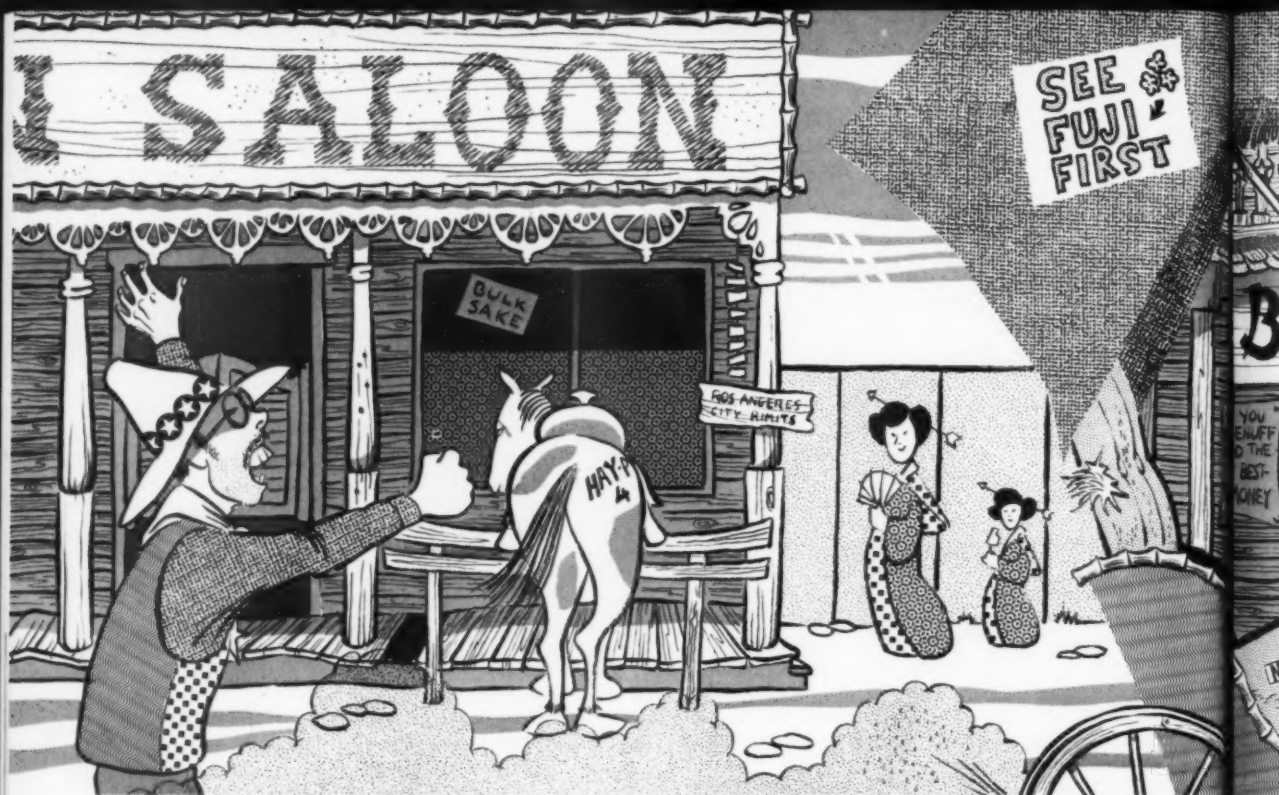
"The hook was a definite aid in judging altitude just prior to contacting the water.

"How much flap should be used? This is another point of controversy. Full flaps were used to allow us to contact the water as slow as possible. I definitely remember a slight nose-high attitude just prior to contacting the water and the airspeed at 90 knots. Lesser flap settings would allow a higher nose attitude but would require a higher airspeed on water impact.

"The foregoing is a collection of impressions which have arisen as a result of being forced to ditch the S2F. I sincerely hope that this information may prove helpful to some who may find themselves in a similar situation and also may provide some knowledge about ditching characteristics of the S2F."

So much for the letter. This kind of inside information, born of real, hard experience is scarce and plenty expensive. Don't pass it up.

Just in case there is any doubt as to the high quality of pilot performance demonstrated during this entire episode, the AAR endorsements read like this, "Since there was no pilot error involved in this accident, the factors of prime importance appear to be the material failure which was the direct cause of the pilot's decision to ditch and thus the accident, and the subsequent damage to the aircraft. This command wholeheartedly concurs with the pilot's decision to ditch. The orderly and effective ditching is a tribute to the pilots and crewman and of interest to all commands operating S2F/TF model aircraft. This has been made the subject of separate correspondence."



# DODGE CITY

**E**VER hear the story about the troubles Jesse James encountered at the time he was just beginning his colorful career?

Well, it seems that young Jesse had decided to pull his first job, and due to his lack of experience (and obviously Okane), he didn't have a horse of his own, so he very discreetly made arrangements with the Younger brothers (they were still friends at the time) for the loan of a team of horses and a good free-wheeling surrey for the alleged purpose of taking Ma into the General Store. At this time, Jesse was a well thought of young man in his community so the Younger brothers were more than willing to accommodate him.

Imagine the complacent smile on Jesse's face as he hitched up the team, climbed aboard and sedately started off for the First National Bank

in Dodge City, thinking of all the Okane he'd have more sukoshi.

The trip into Dodge City was uneventful, and all the time Jesse was hashing and re-hashing his course of action. On arrival in Dodge, shrewd thinker Jesse deliberately drove at a leisurely pace by the Silver Yen Saloon to make sure the Sheriff and his boys were at their ON LIMITS hangout. On determining they were there, Jesse quickly pulled around the corner and tied up in front of the First National Bank. Confidently and methodically he walked into the bank and up to the cashier, pushed the business end of his Colt .45 in the unsuspecting soul's face and ordered him to "fill this gunny sack with Yen, all in 100, 500, and 1000 Yen denominations." You'd have thought the cashier was gonna have pups too as he obligingly



# Y FABLE

a tale with a moral  
translated  
from the Japanese

by AGySgt M. R. Bloom  
Marine Air Group 16

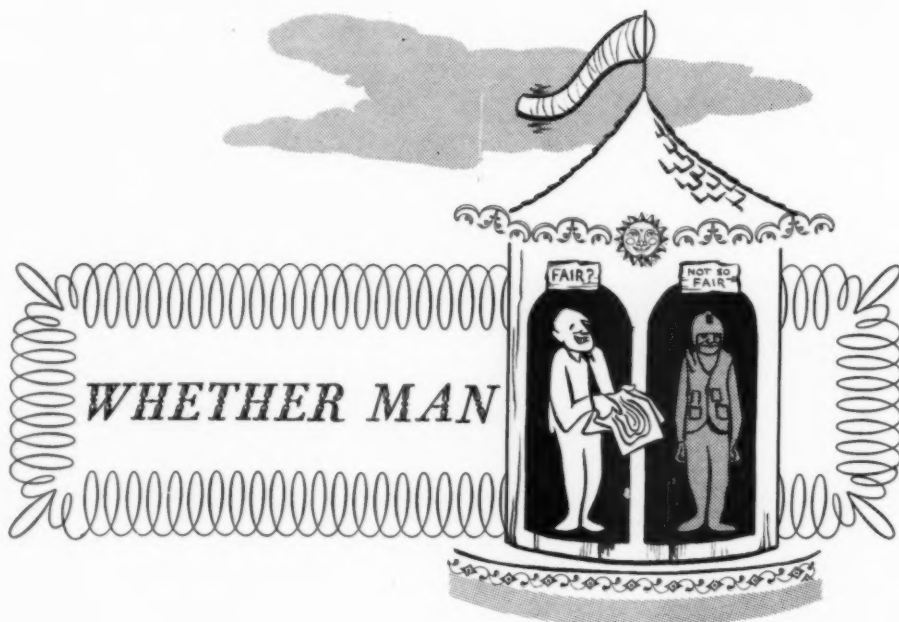
filled the sack and handed it over to Jess.

With a smile, Jess said "I'm a thankin' ya mister" and sauntered cautiously backward out of the bank. Once out the door, three tremendous strides took him to the top of the surrey where he grabbed the reins and yelled "HAYAKU SILVER-SAN." Jess was still keeping an eye on the door of the bank and can you imagine his consternation when the only response he received was a burning sensation as the reins slid through his palms and there went the horses hell-bent-for-leather leaving him and the surrey sitting right there in front of the good old First National?

Jess's first coherent thought was "The harness must not have been locked!" But, Jess, being mighty fleet of foot decided he'd run it out before the Sheriff got out of the Silver Yen. Jumping

off the surrey he began making tracks for the end of town, and had gone about half a block when alas, down fell his trousers, tripping him to the ground where he introduced his noggin to one of the many rocks abounding in the steets of Dodge City in those days.

Sometime later, as Jess was just coming to, he rolled over and peered up through the fogginess straight into the eyes of the Sheriff who said "Who do you think you are, trying to get away with a durn fool stunt like that 'ye young Whipper-snapper?" Admitting defeat, poor Jess just looked him straight in the eye and replied "I'm JESSE JAMES, and ya' dang'd right I was trying to get away with it, and by golly I'da made it too if I'd just LOCKED MY HARNESS AND BUCKLED MY BELT!!!"



**T**HERE were these two cats, see. And did they ever get into some trouble of serious nature. Almost worse than Caleb Flerk and his old bent-wing F4U, it was.\* Actually the cats were "Tigers," F11Fs from the Iron Works up at Bethpage, and they came equipped with Pilot; one, each, LTJG type. Actually too, the cats didn't get beat up on this hairy ride, the pilots' nervous systems took the beating.

The two-plane flight had dropped in for fuel and food at Wurtsmith AFB, a convenient

\* If you haven't read this old classic write APPROACH for a copy.

stopping place on the shore of Lake Huron, and now with men and beasts refreshed, it was time to leap off again. Destination was an air station some 650 miles downstream from Lake



Huron. Weather did not appear to be a problem. At this point we take a bit of liberty with the

probable conference which took place in the weather office.

"You'll have eight thousand overcast and seven miles visibility at destination," the forecaster predicted. "That's for ETA plus two hours," he added.

"Umm — sounds good. We won't need an alternate then. By the way, is that a gold-plated eight over and seven?"

The forecaster sighed. "It's as good as you can get these days. The gent at your destination is even going for better visibility than I am. Besides, Weather Service went off the gold standard some years ago; along with

The purpose of Anymouse (anonymous) Reports is to help prevent or overcome dangerous situations. They are submitted by Naval and Marine Corps aviation personnel who have had hazardous or unsafe aviation experiences. As the name indicates these reports need not be signed. Forms for writing Anymouse Reports and mailing envelopes are available in ready-rooms and line shacks. All reports are considered for appropriate action.

— REPORT AN INCIDENT, PREVENT AN ACCIDENT —



the rest of the U.S. and A." With his last words the forecaster reluctantly reached for a clipboard of sequences, thumbed the yellow teletype paper several moments then squinted again carefully at his surface and upper air charts. He next looked at the pilot who had signed as flight leader. "I really don't think you'll need one, but is there an alternate along the route which can handle your planes—make it to the east of your destination if you can."

"I planned on using Sewart Air Force Base anyway," replied the flight leader. "It's not too far off the route." He picked up the DD-175 and nodded. "Thanks for the dope." The forecaster waved his hand in farewell. "No trouble at all, Navy. Have a good trip and come see us again."

At takeoff the forecast remained the same. When the two jets came in communication range of the Center at their destination the weather was checked again. The pilots were told the ceiling remained at 8000 feet overcast, visibility eight to ten miles. Approximately 50 minutes after takeoff they reported over the last enroute fix. The destination fix lay 25 minutes ahead, under the sheet of cloud which seemed to stretch to infinity. The flight leader requested present weather and the Center stated it remained as before.

In a few minutes communication was switched over to approach control as directed by Center and the aircraft bored on toward the destination Tacan. Five minutes before station passage, approach control suddenly came on the air with a special: "Present weather is now 200 overcast, visibility one-quarter mile in rain, fog and snow."

"What?!" The airways shook with indignation. "Where is that eight thousand and eight which

Center was peddling a couple of minutes ago!?"

"That Special observation is correct sir. And for information, we have had three aircraft attempt approaches in the last ten minutes. All of them made missed approaches."

"Oh that's great, just great."

Upon being so startlingly informed of this supposedly 20-minute drastic change in weather, the pilots zipped back to Center frequency to check on their alternate. It had seemed superfluous; now it was an ace in the hole—they had outguessed the weather guessers. But in the strange way that trouble grows when something goes wrong, the roof fell in. In a one-in-a-million chance Sewart AFB had experienced a complete power failure. It could not be used as an alternate.

"Our fuel remaining at this time was less than 2000 pounds," the pilots recalled. "Fuel consumption was about 2200 pounds an hour at our 40,000-foot level. We were VFR on top but our air-



craft were 'Tacan only.' Center was asked for any field in the area with weather above minimums and 8000 feet of runway. None was available."

With all bases to the west clobbered; the closest GCI site 200 miles away; and the closest Metro (pilot to forecaster) station over 100 miles away, the pilots made a quick decision to point their noses southeast and head for Columbus AFB, down Mississippi way. This field was

160 miles distant and without Tacan. Little Rock, closer and with Tacan, was in the area afflicted with weather trouble.

So there they were; on top of an overcast which was solid to 39,000 feet and with no approach navigational equipment. As fast as the change in plan had been some minutes had inevitably been lost. The fuel situation was to haunt them throughout the remainder of the flight.

"An emergency was declared," the pilots continued, "and we both commenced squawking 'Mayday' on IFF. Center was unable to make radar contact for vectors so we proceeded toward Columbus on outbound Tacan bearings. In the vicinity of what we estimated was Columbus, we contacted the tower and hoped for a radar vector. At this point we estimated 12 minutes fuel remaining." As it turned out this estimate was slightly in error. Fortunately it was on the conservative side and the pilots had about 5 minutes more than their 12-minute estimate.

"Columbus was unable to paint us on radar due to our altitude and heavy precipitation but they did begin to work us with UHF/DF gear. We headed for the station at 40,000, following vectors. Communications difficulties necessitated a shift to Guard but the DF service continued.

"At station passage we commenced a maximum performance idle penetration, entering the clouds at 39,000. The penetration was made on DF vectors until radar was able to paint us about 14 miles north of the field then we were passed to radar control. We finally broke out at 2300 MSL, about 2000 feet above ground, in a driving rain. Visibility was less than a half-mile but straight ahead through our windshields it was zero.

"Precision radar was set up

for the opposite runway so an ASR was accepted. Fuel was going to be a real touchy thing. We were vectored more or less straight in, descending, to less than a mile and at about 200 feet terrain clearance. There, visual contact was established with the strobe approach lights. A normal section landing was effected without further incident.

"On shutdown, the plane with the least amount of fuel had 170 pounds remaining. This represents about two minutes flight in the landing configuration. With less expeditious handling or a momentary hesitation on the part of the controllers (or pilots we might add), this situation definitely would have resulted in the loss of two aircraft, at one million bucks apiece, and possibly the loss of one or both pilots."

Thinking about what they might have done to prevent the situation the pilots brought up the point of failing to keep in touch with the several Channel 13 Metro stations enroute to their destination. But as the flight leader commented, "I'm not arguing with success in this case."

## AMEN

**I**MEDIATELY after takeoff in a *Cougar* I noticed my temperature control would not lower the temperature from full hot. I was No. 4 in a division formation and I went ahead and joined up, saying nothing as I felt altitude would cool the cockpit to working temperature.

Passing through 23 thousand in a parade turn I began to feel a pressure in my head. The oxygen quantity gage and blinker checked O.K. and I fiddled with the air conditioning some more—altitude hadn't cooled the cockpit very much.

The next thing I knew I was still in a banked turn, feeling

very strange. No formation was in sight. Several calls on tactical brought no response from the rest of the flight though I could hear them calling me (later I found I had been out of sight for several minutes and the flight was calling me on Guard). Another aircraft from the squadron called me on tactical and told me to descend to 10,000 feet and switch to 100 percent oxygen. I did both, noting that my blinker had been apparently working properly before going to 100 percent.

In a short while I felt all right and I called for, and got, GCI steers to home base. The rest of

the trip and the landing was uneventful.

My first mistake was in continuing the flight with the air conditioner jammed in full hot. A pilot cannot work smoothly in such heat and pure altitude will not cool the cockpit sufficiently.

The second mistake—which almost cost me my life—was in not checking my mask before putting it on; the inhalation and exhalation valves (total of three) were missing! The mask had been cleaned the week before and I had not checked it after receiving it from the oxygen shop. Three hops had been flown with it that way with no ill effects—



I can offer no reason for this. But, it takes only ONE hop for hypoxia to get you.

## LUCKED OUT

ON A cross-country, the return to my home air station started off wrong when I couldn't accept an IFR climb as it would have taken me in the wrong direction. I got a VFR climb but had to go way off course to stay VFR and thus used 50 more gallons of fuel in the climb than I had figured on.

To regain some of this fuel I climbed up to 45 thousand, also hoping I'd have less headwind at this altitude, but after passing two fixes, the wind still figured close to 90 knots headwind component. A quick recalculation of the flight log showed I had enough fuel to destination then to the alternate at 45M, plus 100 gallons for penetration and landing. Over my last enroute checkpoint a weather broadcast gave me a 2500-foot ceiling at home. This tension-easing report did not last.

Five minutes later, with only five more minutes to an anticipated routine penetration, my rosy plans for breaking out VFR before reaching low station went into the wastebasket. The center advised me that squall line was expected at my destination about the same time that I was due there.

Hastily I shifted to tower frequency and got a report of 800 feet and lowering, two miles visibility in rain with winds to 35 knots. I couldn't get late weather for my alternate but fortunately another military field was about 30 miles from "homeplate" and in a direction which would put me ahead of the squall line. They were on the sequence report as 1500 and 3.

I filed a change of destination

with the tower and requested immediate penetration upon arriving at my new destination. Going back to Center they threw a left jab with a Rapcon frequency which I didn't have channelized. At station passage I finally got contact and a clearance to descend at the same time. Into the soup at 38 thousand.

It was turbulent as I expected and the bird dog started to orbit, also as expected. Before starting the penetration I had been in bright sunlight but at ground level it was past sunset so it proceeded to get dark mighty fast once I was in the clouds and descending. Raising my sunvisor and turning on the lights helped.

Now Rapcon scored again with the announcement that they were unable to pick me up on their scope even though I was squawking IFF as requested. In penetration turn, another quick goal by Rapcon put me further behind in the game; GCA was reported inoperative. A late weather report gave me only a 400 foot ceiling with visibility lowering to a mile in rain showers.

About this time I proceeded to get shook. There was fuel enough to go on in to this field or hold my altitude and go on back to home field . . . but there was nowhere else to go. Home station weather was just about what I had here and no GCA was operating there either. Numerous tall buildings and antennas were near home field too. The decision was made. I continued my present approach.

At minimums (700 feet above ground) I was in rain and broken clouds and was unable to get a clearcut bearing from the bird dog. Lights became visible through the breaks so I eased down below the clouds (300 to 400 feet). Then the ADF settled down and showed that I was just about on the correct heading for the homer which was located at the field.

Finally the rotating beacon

and runway lights came in sight and I dropped gear and flaps. Clearance was given for a straight-in but I'd have been landing with a 12-knot tailwind on a water-covered 6000-foot runway so I requested a circling approach to the reciprocal heading.

The flight was not over yet as I found when I reported "gear down" while turning base leg. A second glance at the instrument panel showed that the starboard gear indicated UP, though the warning light was OUT. I beat on the indicator and cycled the lever but the indicator wouldn't budge out of the up position. By this time I was close in and had to wave off.

I advised the tower of my predicament and then lost sight of the field a few times while dodging towers and buildings, cycling gear on both normal and emergency systems and trying to maintain visual contact with the ground. The leading edge tanks had gone dry after my first wave-off and after two flat-hatting orbits around the field I had only 50 gallons left. I advised the tower I would land on the next pass regardless of gear configuration.

About this time the right-hand indicator suddenly indicated down for the first time in this fiasco but the gear warning light stayed ON. Well, it was an improvement in the situation so I landed anyway. To my great relief the gear didn't collapse. The crash crew put in my landing gear safety pins and I taxied in feeling mighty relieved to be down and with the airplane in one piece.

I guess the moral of the story is, "If everything else fails, be lucky."





# headmouse

Have a problem, or a question?

Send it to

he'll do his best to help.

## Semicircles

Dear Headmouse:

I can't remember where I saw some words about entering a specific altitude(s) on a VFR DD-175, so the ODO could check the altitude against your direction of flight. Is there anything official published on that subject? If so, it would be well to make pilots aware of it, as most of us enter "VFR" in the altitude blocks.

W. E. BEHRINGER, CDR

NAS Moffett RATCC

► You're right in that listing a specific altitude would enable the Ensign ODO to invite your attention to your error, but if you're not actually going to maintain an altitude, it's somewhat impractical to state one. OpNav Inst 3722.8D, which deals with Flight Service reporting procedures, says, "... The following items will be transmitted to the Flight Service Center within 5 minutes after the flight departs: ... f. Cruising altitude, or the term 'VFR' (for VFR indicating specific altitudes is not mandatory)."

In case that thoroughly clarifies it for you, here's a gem from CAR 60 which apparently leaves the door open for the gent who may want to insist that you declare an altitude ... 60.33: "If a VFR flight plan is filed, it shall contain such of the information listed in 60.41 as air traffic control may require." And 60.41 (e) says, "cruising altitudes or flight

levels, and the route to be followed."

If you're confronted with the situation, the semi-circular course rules are published in the FLIP Enroute Supplement and the Planning Document.

Very resp'y,

HEADMOUSE

## Detached Duty

Dear Headmouse:

For the past two years I have served aboard various carriers of both types as a utility 'copter pilot. I have accumulated around 700 helicopter hours and feel myself well qualified to perform my job.

Recently, I have noted what seems to be a complete disregard on the part of the ship's company personnel toward the operations of

the detachment helo. Invariably, the 'copter pilot is faced with the age old question "should I attempt engagement/disengagement, or not?" Since most recommendations aimed at Pri-Fly from the helo cockpit are usually disregarded or overlooked, 'copter pilots are finding themselves taking added chances every day. With the idea in mind "I'm trying to please the ship" but "I don't want to sacrifice safety for speed," the pilot of the angel is faced with winds marginally lower than the recommended maximum wind velocity coming from a direction goodness knows where.

When he attempts to argue, or plead, for better winds, he gets the common answer "the last detachment did it, why can't you?" The air boss might then say "the wind is in accordance with the wind diagram, so what's your beef?" Of course, he hasn't really considered that the wind direction is off the ship's centerline by more than 20 degrees, and the turbulence is unpredictable. He hasn't really considered that with an increase in true wind velocity, gustiness increases markedly. So, you go back to your HUP or HUK and give it one more try. Sometimes, however, circumstances catch up with you and the blades just don't quite make it over the fuselage. Whack! I know, it's happened to me twice this year and neither time could I do anything to prevent it.

This breed of helo drivers vociferously asks for better operating conditions for engagement/disengagement, but to no avail. Please, when will carriers take heed of our existing helo wind diagrams and instructions?

ANYMOUSE

► Your cries are being heard—at least two carriers (RAN-DOLPH and VALLEY FORGE) are



"It's by far the best ejection seat demonstration I have ever seen!"

taking anemometer readings whenever such readings are necessary for choppers by a handheld instrument on the flight deck, rather than from an anemometer six or seven levels above the flight deck. Accident investigators using this method reported differentials up to 16 knots. We suggest your leaders invite skipper's attention to "Dear Skipper," APPROACH June '57, page 31 (also in "Helicopter Flyboy")—or show him a collection of shipboard helo accidents from your safety officer's "Crossfeed" file.

Very resp'y,  
HEADMOUSE

### How High?

Dear Headmouse:

"Aerology for Naval Aviators" (pp. 1-19, 1-20) and "All-Weather Flight Manual" (pp. 3-11) state that an aircraft flying from a warm to a cold air mass will be flying at an altitude lower than that indicated by the pressure altimeter. The E6B Computer is also calibrated on this basis.

I am not in a position to refute this statement but the reason given for this phenomenon is erroneous. The above references base their reasoning on the theory of pressure change.

From Dalton's Law we know that pressure is inversely proportional to temperature. Therefore, as we fly into a cold air mass the pressure

risks and in order to maintain the same pressure altitude the aircraft must climb. This is demonstrated in the figure below.

Please refer to Figure 1-21 of "Aerology for Naval Aviators." It is true that a higher column of warm air is needed to balance a relatively short column of cold, more dense air. However the reading of a barometer or pressure altimeter is determined by the weight of air above the aircraft. Thus the picture renders a false impression. At the same flight level the weight of cold air above the aircraft is heavier than the weight of warm air. Thus the altimeter reading in the colder air will be lower at the same flight level.

Certainly we haven't been making this temperature correction in the wrong direction. The references undoubtedly do not lead us to a false temperature correction but they do theorize improperly.

I would like to know the proper theory behind this temperature correction and further would like to see the references give a proper explanation.

HARRY C. SPARKS, LT

VS-864

► To solve your dilemma perhaps we should first review the gas laws:

At constant volume pressure varies directly with temperature.

At constant temperature, pressure varies inversely with volume.

At constant pressure, volume varies directly with temperature or

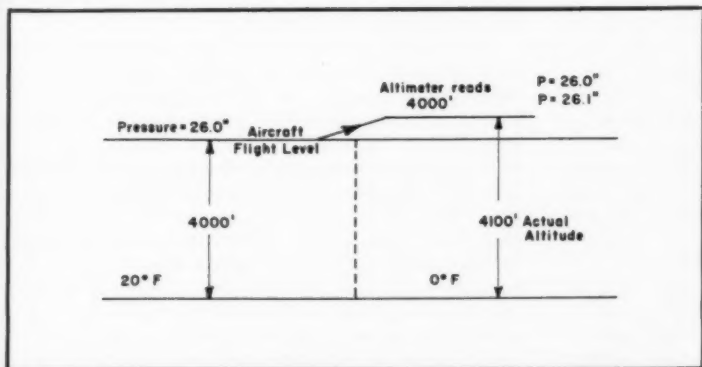
$$\frac{P_1 V_1}{T_1} = \frac{P_2 V_2}{T_2}$$

Next, let us consider several possible cases involving questions as to whether the surface pressure is the same at takeoff and destination, or different. If the surface pressure is the same, the aircraft will descend while flying a constant pressure surface from warm to cold air since the constant pressure surfaces are packed closer to the surface in cold air (See figure 1-21 of Meteorology for Naval Aviators). If the surface pressures are different but the temperatures structures are the same, the aircraft will climb in going from low to high (See figure 1-20). If the temperatures are also different, the plane may climb, lose altitude or stay at constant true altitude depending upon the relationship of temperature and pressure structure.

In picturing the atmosphere and the weight of air above the plane which determines the pressure, it is necessary to realize that a cold high cell is essentially a low-level phenomenon so that at some higher altitude, the constant pressure surface is again horizontal. If figure 1-19(a) were extended vertically, it would show a gradual diminution of the depth of the trough so that at 700 mb perhaps the line might be horizontal across the diagram.

If you fly a constant altimeter setting, you are flying a constant pressure altitude. Thus, the altimeter reading does not change even though the true altitude does.

Very resp'y,  
HEADMOUSE



# Grin and Wear it!

**T**HE seasons change. Winter turns to spring and spring to summer. The raucous voice of the aviator regarding heat and his anti-G suit can be heard in our land.

We'll be among the first to agree with you that your anti-G suit plus your summer flight suit plus the well-warmed cockpit of an aircraft parked in the sun plus a soaring thermometer, add up to hot, hot, hot. But let's face it—there comes a time when creature comfort is secondary to creature safety and a flight where high G-forces may be encountered is one of these times.

Throughout the Navy, the pilots who fail to wear their anti-G suits are a problem, a puzzle. MOR's and AAR's continue to come in to the Naval Aviation Safety Center with the comment that pilots in question did not have on their anti-G suits. (A study of all accidents in calendar year 1959 involving aircraft having anti-G equipment disclosed that 161 of the pilots concerned were *not* wearing their anti-G suits.) The usual "reason" is "the flight required no high-G maneuvers" or "I did not anticipate pulling any G's." As one exasperated safety type put it, "Gentlemen, unless they subscribe to a horoscope service I'm not acquainted with, *how can they be so sure?*"

A pilot's common sense and instinct for self-preservation (inherited from Ugh, Son of Fire, who was never caught outside the home cave without his anti-dinosaur club) should motivate him to wear his anti-G suit. OpNav Instruction 3710.7A states: "*Anti-blackout suits shall be worn and connected in aircraft equipped for their use on all gunnery, dive-bombing, rocket, strafing, simulated combat and acrobatic flights and on all other flights where high G forces may be encountered.*" If you are a sea lawyer sort you can argue for hours over the literal and the intended meaning of "may be encountered" but for our money it means *wear that anti-G suit*. In high performance aircraft, the chance of encountering high G-forces unexpectedly is always a very real and present possibility.

Take for instance the following case:

A pilot of an A4D-1 made a material induced wheels up landing. He was not wearing his anti-G suit because "the hop was only for field carrier landing practice." Accident investigators pointed

out that "what started out as a routine low altitude landing practice hop could have involved strenuous high G-load maneuvers in order to overcome the unsafe nose gear condition. Without anti-G suit protection, however," the report continues, "any maneuver of this type would have been potentially very hazardous."

## Purpose of Anti-G Equipment

The purpose of anti-G equipment in high performance aircraft, as everybody in this business is supposed to know, is to counteract the effects of prolonged acceleration on the pilot—from excessive fatigue and decreased alertness to blackout and unconsciousness. Your flight surgeon can explain the physiological whys and wherefores for this in detail.

In brief, the force of inertia in acceleration increases the weight of your body proportionally to the pull exerted by the earth's gravitational field. The increased "weight" has many effects, the most important of which is the effect on your circulatory system: your heart is not able to pump enough blood to your head. Your vision is affected and you can black out and eventually become unconscious.

Your anti-G suit counteracts these effects. With the anti-G system, compressed air is metered to the suit in proportion to the acceleration. The suit compresses your legs and abdomen. This keeps the blood from pooling in the blood vessels of your abdomen and legs and forces it from the lower to the upper part of your body.

The anti-G suit does not raise human tolerance to accelerations above the stress limits of present-day fighter aircraft. It merely matches the man to the aircraft especially in those cases in which the natural relaxed tolerance to G forces is low. Without an anti-G suit, the average pilot can withstand 4.5 to 5.5 G for eight seconds before blacking out. With an anti-G suit, he is capable of withstanding 6.0 to 7.0 G. (This protection, however, is available only for sustained accelerations of 4-5 seconds or longer in maneuvers other than snap maneuvers. The anti-G equipment does not offer protection in snap maneuvers where 10 to 12 G can be applied in approximately one second. Snap

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maneuvers tend to bypass the physiological symptoms due to accelerative forces but introduce the hazard of overstressing the aircraft. Pilots accustomed to using greyout as an index of G may be misled by the absence of symptoms during a snap maneuver and may exceed the structural safety factors of the aircraft.)

Your anti-G suit has four main functions:

- To protect you against greyout, blackout and unconsciousness
- To alleviate fatigue and decreased mental alertness which may result from repeated accelerations below the blackout level.
- To provide you with a method for relieving leg stiffness and physical tension during flight.
- To give you an indication of the accelerations to which your plane is being subjected.

Two types of anti-G suits are available: the Z-2 or full garment and the Z-3 or cutaway.

Although not intended to take the place of your life vest, your anti-G suit can be used as accessory flotation gear for extra buoyancy. You can inflate both the coverall and the cutaway anti-G suit orally. In the event that the suit is used for flotation gear, both legs should be unzipped first.

The anti-G coveralls are made of a relatively heavy weave nylon which affords flash burn protection nearly equal to treated cotton. Like wool and flame-retardant treated cotton, the heavy nylon of the anti-G suit is self-extinguishing. However, since nylon does melt and form droplets which retain heat and can cause additional burns, it is

desirable to wear an additional layer of cloth for protection. BACSEB 23-57 recommends the following combinations of clothing:

- 1) Summer weight flight suit (flame-retardant treated) over the full-garment anti-G coveralls or the full-garment anti-G coveralls over the waffle weave underwear (stock no. FSN D8420-270-2008 to -2012 inclusive).
- 2) Anti-G cutaway coveralls over the summer weight flight suit (flame-retardant treated).

#### Applicable Bulletins

Here is a complete list of BACSEBs currently applicable to the anti-G suit:

BACSEB 23-57

Anti-G Equipment; Information concerning

BACSEB 35-57A

Replacement of coupling component of quick disconnect in Z-2 anti-G coverall (stock no. R8415-261-6417 through -6427) manufactured under contract number N383-40133A.

BACSEB 26-58

Anti-G Equipment; information concerning modification of

BACSEB 26-58A

Z-2 Anti-Blackout Suit: Information concerning modification of

BACSEB 12-59

Repair of Lacer Loop Tape on Type Z-3 Anti-G Suits

The anti-G suit is designed for *your* benefit . . . to save *your* life . . . WEAR IT!

# DIRT...

Dirt and sand have their place but not in a pilot's oxygen mask.

In a recent flight incident, a pilot was temporarily incapacitated by his dirty oxygen mask. Fortunately, with the assistance of the plane captain, he made a successful landing, no harm done.

While flying a routine operation at 15,000 feet on normal oxygen, the pilot felt fine, was making accurate decisions and noticed nothing unusual. Then he felt a mild irritation of the

throat causing a slight cough. He later compared the sensation to breathing in dust or sand in the air. After a minute or so, his cough became severe.

At this time the pilot had the plane captain switch his oxygen regulator from normal to 100 percent, but this did not help any. His cough rapidly got worse, becoming very painful. He could barely speak. His eyes began to water. A stick of chewing gum soothed his throat somewhat but didn't help his cough.

The pilot began an immediate descent while the plane captain took over all voice communications until the aircraft stopped on the taxiway. During the descent, at about 13,000 feet, the pilot retched and took off his oxygen mask for the remainder of the flight. He felt a little bit better. After landing, however, speech and deep breathing were difficult and painful.

After the flight, the pilot's oxygen equipment was examined. His mask contained excessive dust and sand particles. It is believed that the dirty oxygen mask resulted in aspiration of foreign matter causing a spasm of the larynx and temporary incapacitation, the flight surgeon reports.

Although they played no part in this incident, other discrepancies were found in the pilot's oxygen equipment. An A13-A mask was being used with a



notes from your  
**FLIGHT**  **SURGEON**

2858-A1A regulator. In this regulator the emergency oxygen valve delivers full pressure from the oxygen cylinder to the mask which can be up to 1800 PSI. As the pressure compensating exhalation valve would be sealed shut at this pressure, the excess pressure would have to leak around the mask or dangerous pressure would build up in the lungs. The oxygen hose had a green Erie connector instead of the current red MC-3A connector which could have resulted in the pilot's breathing cockpit air had the mask become inadvertently disconnected during flight. (Refer BACSEB 29-57: Oxygen Mask to Regulator Connector Assembly, Type MC-3, modification of.) An examination of the regulator disclosed that it was defective in that excessive effort would be needed to breathe 100 percent oxygen.

Had the oxygen mask been presented for routine cleaning, these discrepancies would have been discovered, the flight surgeon points out.

### Don't Rush

**"THE** pilot seated himself easily on the anchor seat and was hoisted to the HUP-2 without incident. However, upon entering the helicopter facing aft, he could find nothing to grab hold of and grabbed the transmission housing which could have resulted in injury. All rescuees should be instructed that upon entering helicopter by hoist they hold on to the sling or seat until the hoist is completely and fully raised into the helicopter. The crewman in the helicopter then will instruct them in what to do. There is no need for rush at this stage. Usually, the crewman can swing the person aside and close the hatch so the person can step from the sling or seat."—*from an MOR*

## Memo:--

**Subject:** Hardman Suspension Kit *plus* chin strap *plus* nape strap *equals* good retention capabilities.

**Interested Parties:** Flight Personnel, Flight Surgeons and Parachute Riggers.

**Situation:** Out of 112 successful ejections during 1959, 16 pilots lost their APH-5 helmets. It is interesting to note that no pilot who reported that he had the Hardman Suspension Kit *plus* the chin strap and nape strap installed lost his helmet. BUWEPS AVIATION CLOTHING AND SURVIVAL EQUIPMENT BULLETIN NO. 17-58A, recently released, contains instructions for the reinstallation of the chin strap.

**Recommendation:** NASC STRONGLY RECOMMENDS THE RE-INSTALLATION OF THE CHIN STRAP.

### Escape Aid

**W**HEN an HSS-1N went down off the California coast, the pilot and copilot escaped from the sinking aircraft. The two crewmen, unable to escape, drowned. The Aircraft Accident Board concluded that the crewmen were disoriented with respect to the escape hatches.

Among the recommendations in the AAR is that a strap be placed diagonally across the sonar compartment so that crewmen can reach up and follow the strap to either escape hatch.

### Floats Face Forward

**T**HE pilot of an F8U-1 made a successful ejection and parachute descent. On entering the water he separated from his parachute canopy by disengaging the two upper Rocket Jet fittings. After inflating his Mk-3C life vest, he found he was floating face forward. During the parachute descent he should have disengaged the lower (preferably left) Rocket Jet fitting, to move the center of buoyancy of the seat pack.

### Quick Ejector Snaps

**T**HE pilot of an F9F-8 ejected successfully after there was an internal explosion in the engine section of the aircraft followed by engine flameout and a fire external to the engine. The accident report states that the pilot had "old type fasteners—not quick-disconnect" on his parachute. He had difficulty unfastening the leg straps.

BACSEB 7-58 of 28 Feb 58, concerning identification and aircraft application of parachute assemblies, provides that all existing NS-2 and MC-2 assemblies having harnesses with the old type non-ejector snaps be modified by replacing the harnesses with ones equipped with ejector type snaps. The BACSEB states that all NB-2 parachutes shall be modified by replacement of the harnesses with harnesses equipped with ejector type snaps.

These three parachute assemblies after modification will be known as NS-3, NC-3 and NB-3 assemblies respectively.

If your squadron utilizes the parachutes mentioned in this bulletin, have the required modifications been made?



# "SCUBA DIVERS DO PITCH IN!"



**R**ESCUEING personnel from aircraft in 50 feet or more of dark ocean water is no easy task!

Since most naval air stations are bordered, if not almost completely surrounded by water, supplementary rescue procedure for crashes occurring in contiguous water areas has been and is still a problem of grave concern.

At NAS North Island, which is almost surrounded by water, the supplementary rescue procedure used reflects the benefits that can be derived when activities in an area surrounding an airport cooperate with each other in an effort to save lives.

Although some air stations may have a similar supplementary rescue program, the following description of pre-crash planning at NAS North Island should be of interest and possible assistance to other naval air stations.

Four actual cases, ranging from jet to helicopter tragedies, occurred at NAS North Island within



UDT men with proper training can be of valuable assistance in aircrew rescue and salvage work.

the last year. As a result, every avenue of possible aid to augment the command's crash rescue potential was investigated.

The most recent substantial strengthening of the pre-crash planning program occurred in the following manner:

Underwater Demolition Teams from the Naval Amphibious Base, Coronado, and the Naval Electronics Laboratory (NEL) located at Point Loma, San Diego, were contacted and agreed to work with NAS North Island by supplying SCUBA



divers and equipment to aid in the rescue of personnel involved in any crash in the waters surrounding North Island. (SCUBA divers are men with Self-Contained Underwater Breathing Apparatus—Navy version of the popular skin diver.) The commanding officers of NEL and UDTs agreed to avail men for water rescue work on five minutes notice during working hours and as rapidly as possible after working hours.

The U. S. Coast Guard Unit located at Lindberg Field, San Diego is charged with primary SAR responsibility for the San Diego area and supports any crash rescue operation with a crash boat and three helicopters available on immediate call, 24 hours a day.

When a crash occurs in the water near NAS North Island, the tower, coordinating with the NAS operations duty officer, immediately puts the Crash and Rescue Bill into effect. In addition to dispatching NAS crash boats to the scene, the operations duty officer immediately alerts the OOD of UDT and NEL and requests that SCUBA divers stand by for pickup by Coast Guard helicopter. It is important to note that all of this takes place in two minutes or less!

By the time the Coast Guard helicopter becomes airborne, it has already been determined which group of divers will be most readily accessible and the pickup helicopter is directed by radio to the proper location.

With the North Island Crash Boat racing to the crash site and with the helicopter on its way with divers aboard, it is believed that one of the major problems—the fight against time, has been reduced

to a minimum. If the crash had occurred in the channel near the station, the NAS crash boat would probably be first on the scene; if the crash had occurred to seaward out of the immediate reach of the crash boat, the helicopter would be on the scene with divers within minutes, possibly as much as an hour before the boat could arrive; a significant time difference when lives are at stake! It is possible that with this new system SCUBA divers can be at the scene of a crash within 10 minutes even if the crash occurred as far as 10 miles out to sea. Additionally, it is noteworthy to mention that UDT men because of special training, when operating in pairs, can be lifted out to sea by helo and will work without surface support up to depths of about 150 feet.

All the SCUBA divers in the area who participate in this program have been given cockpit enclosure checkouts by NAS crash crew personnel to acquaint them with the emergency canopy release system of the various aircraft that fly out of NAS North Island.

There has already been occasion to call on the above-mentioned activities for assistance, and they have proved invaluable. Recently, an AD-5W experienced power failure immediately after takeoff from North Island, struck the water in a steep nose-down attitude and sank in 50 feet of water. The pilot's flight clearance was checked immediately by the airways division and it was determined that there were three people aboard the aircraft. Two survivors were picked up by a nearby fishing boat and transferred to a Coast Guard Cutter. The NAS operations duty officer called the NEL and UDT OOD, requesting them to have divers standing by. He then directed one of the Coast Guard helos, both of which had already taken off, to UDT headquarters to pick up two divers and take them to the crash site. The divers, augmenting the station divers, recovered the body of the third man and although he was dead on their arrival, the time from the crash until the divers recovered the body was only 20 minutes.

It is very reassuring to know that so many other units in the area are ready, willing and able to assist if the need arises. It is possible that if Operations Department personnel at other air stations investigated outside activities willing to lend a helping hand during an emergency, their crash and rescue procedures could be immeasurably strengthened. NAS North Island has definitely found that SCUBA divers do pitch in!—Contributed by NAS, North Island, Operations Officer

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# when the crash alarm sounds.....

ready answers for the following questions will save precious time...

**WHAT MODEL AIRPLANE HAS CRASHED?**



**HOW MANY PERSONS IN THE CREW?**



**WHERE ARE THEY LOCATED IN THE AIRPLANE?**



**WHAT POINTS OF ACCESS ARE PROVIDED FOR QUICK RESCUE?**



## rescue requires...

... quickest entry to the aircrew through ...

- **NORMAL ENTRANCE DOORS** ..... MOST RAPID MEANS IF OPERABLE
- **FIXED CANOPIES** ..... WINDOW MAY BE BROKEN FOR INSIDE RELEASES
- **EMERGENCY HATCHES** ..... FASTENERS MAY BE MORE COMPLICATED
- **PLASTIC WINDOWS** ..... MOST EASILY BROKEN WINDOW MATERIAL
- **SAFETY GLASS** ..... DIFFICULT TO BREAK AND HANGS TOGETHER
- **JAMMED ENTRANCES** ..... MAY BE FORCED MORE EASILY THAN CUTTING WALL
- **FUSELAGE WALLS** ..... MOST DIFFICULT MEANS UNDER USUAL CONDITIONS



# WHY DO FUEL BOOST PUMPS FAIL?

**M**ANY reasons for failure of the 64-1033-5 fuel boost pump in the A4D are listed below. The principles outlined have application to other model aircraft as well. These give a good idea of what happens with use of improper procedures.

*Fuel boost pumps may fail:*

1—If power is applied to a fueled aircraft immediately after a new pump is installed.

*Result:* Air is trapped in the pump housing, preventing fuel from lubricating the bearings; the rotor then seizes and one or more phases of the field windings burn.

*Caution:* Wait at least 15 minutes before operating the pumps. This permits trapped air in the pump housing to escape and provides fuel for bearing lubrication.

2—If power is applied to an aircraft (not fueled) to check operation of a newly installed pump.

*Result:* Bearings are not lubricated, causing

40 NOTES AND COMMENTS ON MAINTENANCE

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bearing seizure and therefore burning of the field windings in one or more phases.

**Caution:** Pull all 3 pump fuses whenever aircraft is defueled and power is to be applied to aircraft.

3—If a defective external power supply is connected to the aircraft or if the aircraft a-c voltage regulator malfunctions.

**Result:** High voltage or no voltage on one or more phases results in overloaded winding; the worst condition occurs when power is applied to only one phase.

**Caution:** a—Check the external power supply regulation.

b—Check each phase for correct operation.

c—Check the external power source electrical connector for good contact to aircraft receptacle.

4—If power is applied to the aircraft while one or two fuses for the fuel boost pump have been removed; or if pump phases or fuses are checked by applying power to the aircraft and then removing one fuse at a time.

**Result:** There will be an overload of the remaining windings. Worst condition occurs when two fuses are removed—pump will not start and the remaining winding will burn out in 30 seconds. This condition produces a momentary overload in the remaining phases and eventually weakens the windings and insulation, causing failure of one or more windings.

**Caution:** a—Check for lack of continuity from neutral to aircraft structure periodically.

b—Check fuse holder caps to see if brass end of fuse extends  $\frac{1}{8}$ -inch minimum above the lip of the fuse holder cap.

c—Do not check pump phases or fuses by removing one fuse at a time with power applied to aircraft. Make proper continuity check of phase winding or fuses with ohmmeter or continuity checker.

What's more, the motor stator may ground to the housing and burn off the wires in one coil, causing an overload in the remaining phases. To prevent this, a single layer of thin Mylar tape is being added around the exterior of the coil extensions. This increases the dielectric strength between the coils and the housing.

Also, a pump motor may fail if a piece of lock-wire is jammed between the impeller and head.

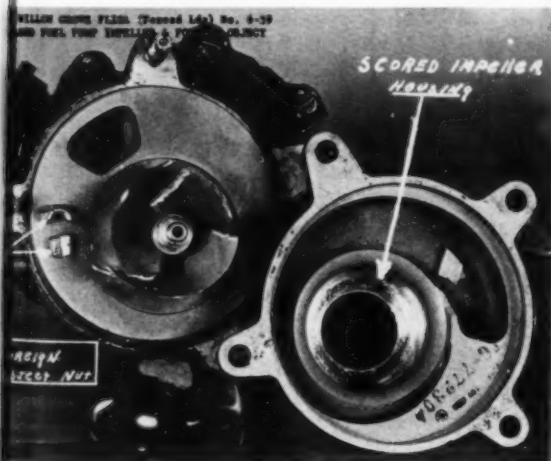
Still, the most likely cause of failure is the pump running in a dry tank.—*Douglas Aircraft Co. "Service Information Summary"*

**OVERTEMPS REQUIRE HOT SECTION INSPECTION**—The previous engine history of this F4D and the events of the final flight lead to the conclusion that this was a failure of the first stage cast-bladed turbine. It is most unfortunate that this engine was not given a hot section inspection before being returned to an "up" status, since it would undoubtedly have shown turbine distress in the form of bowed turbine inlet guide vanes and cracked first stage turbine blades.

It is noted that in this case there were a number of engine "overtemps," not a single one of which required a hot section inspection, but the accumulation plus some possible additional unobserved and/or unrecorded "overtemps" pushed the turbine beyond limits, with resultant failure.—*From an AAR*

**STITCH IN TIME**—The need for more emphasis on the importance and immediate action necessary by squadrons on Aircraft Service Changes is reflected by this statement from an AAR involving an F4D:

"The cause of the accident was determined to be inadvertent actuation of the engine master switch by the pilot at the time he intended to move the crossfeed switch to OPEN position. Nonincorporation of F4D-1 ASC 165 which provides a guard for the engine master switch is considered to have contributed to the accident. This ASC has a safety of flight URGENT ACTION



category. The material for the service change has been available at the squadron since 21 July 1959. Heavy commitments on squadron aircraft, limited number of F4Ds available, and lack of personnel to install the one-man 12-hour change were given as reasons for non-incorporation. The service change was scheduled for incorporation during the next major inspection.

"As outlined in NavAer 00.55B, URGENT ACTION aircraft service changes are so categorized because they either affect safety of flight or operational capabilities of the aircraft. NavAer 00.58B further stipulates that such changes shall be incorporated within 30 days after receipt of the required materials or such earlier time as the cognizant aircraft controlling custodian may prescribe. F4D-1 ASC 165 was issued after the previous accidents in which two F4D-1 aircraft and one pilot were lost due to inadvertent actuation of the engine master switch. Inasmuch as this fact was commonly known and the probability of recurrence existed, it is considered that the service change should have been incorporated at the earliest possible date.

"It is recommended that controlling custodians require early incorporation of those safety of flight service changes wherein a high accident potential exists."

**TEN MINUTES A DAY**—Here is what one station with a poor safety record did to stop accidents: "Daily ten-minute meetings have been held with the people who are out on the 'firing line.' For the first two weeks ten minutes a day was devoted to a review of all past injury and damage accidents at this station. At the end of two weeks, five minutes was devoted to discussing unsafe acts observed the previous day. The remaining five minutes was devoted to reviewing past safety letters."

After a record of six accidents in three months, the station went nearly two months before the seventh occurred. Looks as if the meetings are paying off.—NSC "Safety Newsletter"

**AIRCRAFT INVENTORY RECORDS**—Government furnished technical publications are being entered as inventory items in the Aircraft Inventory Record and are being accounted for during the life of the aircraft. This is neither required nor desirable.

Current BuWeps Instructions provide for direct distribution of handbooks to recipients of new production aircraft; therefore, duplication occurs

when additional copies are placed in aircraft upon delivery (or mailed in lieu of placing in aircraft).

Other undesirable situations result from inclusion of these publications in the Aircraft Inventory Record:

(1) Unwarranted workload is required when accepting or transferring aircraft.

(2) Storage problems are created.

Addressees concerned are requested to delete from all Aircraft Inventory Records the following publications:

- (1) Flight Manual
- (2) Handbook Maintenance Instructions
- (3) Illustrated Parts Breakdown
- (4) Cargo Loading Handbook
- (5) Engine Service Instructions
- (6) Handbook of Inspection Requirements—  
from BuWeps Notice 5600

**THE "YELLOW CARD"**—Correctly called the Graduate Evaluation Report—is designed to gather information as to how well the graduates of the Naval Air Technical Training Command's schools perform their duties. The report form, partially completed, is inserted in the graduate's jacket upon completion of training. After approximately six months, the form should be completed by the supervising officer, or petty officer, and dropped into the outgoing mail basket. You can help to improve training by passing the word down the line that the schools need (and appreciate) the reports.—CNATTC

**OLD REMEDY WORKS**—Occasionally we have mentioned the insidious practice of quick and easy fixes to postpone more thorough and exacting fault isolation and correction procedures.

One of the old stock answers was, "Cleaned and tightened electrical connector."

Now here's one for the books. Shortly after acceptance, a turbo prop aircraft started having high engine oil temperature squawks. Corrective action in this case seemed quite "thorough and exacting." Out of 39 flight crew reports:

- 12 oil temperature thermostats were replaced.
- 2 inducer valves were replaced.
- 2 oil cooler door actuators were replaced.
- 2 oil cooler door actuators were re-rigged.
- 1 oil temperature sensing bulb was replaced.

Then finally, after 481 hours somebody "cleaned and tightened the electrical plug" to the indicator, and that fixed the squawk.—FSF "Mechanic's Bulletin"



## Attention Vehicle Drivers!

We know that you always keep your eyes on the road/ramp/taxiway/runway ahead of you, with enough side-scan to keep from having a mid-field collision with a wandering buffalo or A3D.

And if your vehicle is radio-equipped you depend a lot on the tower to keep you vectored out of harm's way. But what about those occasions when you're out on the field without a radio, or with your radio inoperative? Surely you wouldn't drive in a triangular pattern like the pilots do, and wait to be intercepted—you'd look to the tower for light signals. If you were ever taught the meaning of light signals, do you still know them? What does an alternating red and green light signal mean—quick?

Since the best of memories can occasionally draw a blank, the Aviation Safety Center has prepared a sticky-backed "gouge" which depicts, in color, the approved light signals used by towers. We'll send as many as you need, if your First Lieutenant or vehicle boss will just drop us a note and include just one little safety tip that might help others to drive or work safer. Of course, we'll depend on you to stick it somewhere on the windshield or instrument panel and not on the glass—after all, you can't see the tower's signals if they're blocked by a card depicting the tower's signals. . . . .

**TURN LIMITS**—As an R4D was being towed from the hangar for engine run-up and a hydraulic check, the tail wheel retractor collapsed as the tail wheel was being turned for a change in direction.

Little or no hydraulic pressure was in the gear system. No lock bar or safety cable was installed on the tail wheel. Turn of the tail wheel exceeded the 60 degree limitation while turning.

Recommended corrective action:

1. Paint angle towing marks on the elevator of all R4D-8 aircraft for visual reference.
2. Install tail wheel safety bar before towing aircraft.
3. Insure hydraulic system pressure for the landing gear, normal and three pins installed, before towing of aircraft.

**MAGNESIUM FIRE FIGHTING**—An HUK-1 was parked on the starboard side of hangar bay one for rotor brake repair. An HSS-1N undergoing routine maintenance on the port side of the hangar bay was cleared for a turn-up. Immediately after starting, the engine developed an overspeed of such severity that the engine tore apart, rupturing gas lines causing an explosion and fire.

Sprinkler and foam systems were immediately energized in hangar bay one but the intense heat and rapid burning of the magnesium made it impossible to enter the bay. The fire rapidly developed into a class B gasoline fire and the HUK suffered extensive damage from both the fire and salt water immersion. When the fire was brought under control it became apparent that the HUK was blocking the only possible area for jettisoning. In the interest of saving the ship from possible further fire damage it was imperative that this area be cleared and the remains of the helos in hangar bay one be thrown over the side. The HUK had received strike damage from the fire and it was jettisoned to clear this area.

The accident board recommended that methods of fighting magnesium fires be the subject of extensive research to develop and improve techniques for the control of such fires on board carriers operating helicopters. Any new developments should be made immediately available to the field.

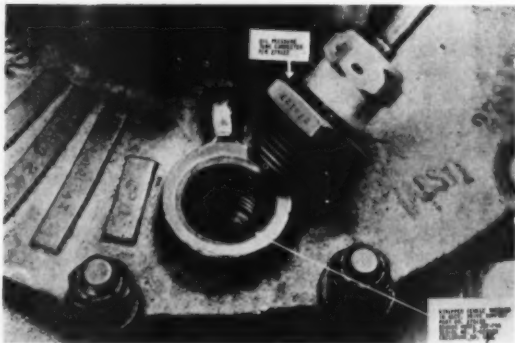
► The Bureau of Weapons maintains a continuous research and development program for fire fighting agents and techniques including the use of TMB. BuAer Instruction 11320.12 and NavAer 0080R-14 contain information and instruc-

tions concerning TMB Fire Extinguishers. Crew training in extinguishing actual magnesium fires with the TMB agent in accordance with BuAer instruction 11320.4A is considered prerequisite to assured crew effectiveness in extinguishing this persistent type fire.

BuWeps states that extinguishing agents are available to operating activities which, if applied in the prescribed manner by qualified personnel, utilizing recommended appliances and equipment, will effectively and adequately control and extinguish all types of fires.

**BUM SHOW**—Personnel were in the process of attaching the hoisting sling prior to loading the aircraft aboard ship. In order to facilitate handing the sling to the man on the wing, the driver parked his ME-1a tractor parallel to the aircraft on the port side, facing aft. He set the parking brake, put the gear shift (Hydramatic) in NEUTRAL and stood on the seat. As he stepped from the seat to the cowl, the trailing sling knocked the gear shift into DRIVE and put the tractor in motion. The tractor struck the fuselage and port wheel door of the aircraft.

The driver was thrown from the tractor and sustained a laceration of the forehead, 1½" long, left side and an abrasion of the right knee as a result of the fall. He violated safety precautions in that he parked his vehicle in close proximity to the aircraft with the engine running and the brake and other controls unattended.



**CROSS-THREADED CONNECTOR**—An in-flight stall and flameout in an F8U was due to the stripping of the female thread in the aluminum alloy accessory drive bearing support assembly, part no. 212923. Cross-threading of the stainless steel tube connector, part no. 278127 during installation caused the thread failure.

Extreme care on reinstallation of the oil pressure tube connector to assure proper thread mating is recommended. Further, should this connection be disconnected for any reason it should be specifically checked for leakage on the preinstallation run-up.—from an AAR

### This Report Is Puzzling!

During one month 102 CO<sub>2</sub> line bottle fire extinguishers were turned in for repair, according to one naval air station. Most of these bottles had damaged parts—from being dropped, dragged, or run over by some kind of vehicle. Very few were turned in for a mere recharging service. The average cost of repair was \$13 per bottle. None was used to extinguish fires, or if they were, the fires were unreported. The puzzling part of this report is—why in the world would anyone in the flying business so mistreat their firefighting equipment as to render it unserviceable? These are the tools of our profession . . . the safeguards of lives and equipment . . . the disaster deterrents. These 15-pound bottles are only as good as the treatment they receive.

**\$ CAN BE SAVED**—When handling engine components, a little care will prevent a lot of headaches. Thousands of dollars worth of engine parts are damaged due to careless or thoughtless handling.

Dirt in accessories, threads stripped or otherwise damaged, compressor foreign object damage, and lines bent and stressed making them susceptible to fatigue failure are only a few of the possibilities.

Materials play a big part in the performance of high speed aircraft. Since every ounce of weight requires an additional amount of thrust to propel it, it is important that lighter materials are used.

Some of these, such as aluminum, have great strength but are more susceptible to damage than steel or cast iron. A threaded fitting made of aluminum has a lower torque limit than one made of steel.

J79-GE-7 drain manifolds are a good example. Many are being rejected because of overtorque, rough handling, and cross-threading. Some of the difficulty could be eliminated by replacing the aluminum manifold with one made of stainless steel. If this were done, however, both our pocketbooks and our performance would suffer. Increases in weight and cost would occur.

Good maintenance practices can eliminate the majority of these rejections and any necessity to "beef-up" engine parts. Use of caps and plugs on open fittings, calibrated torque wrenches, and good storage facilities will do much to decrease your workload in replacement of parts.—*GE "Jet Service News"*

# SURGEON'S HABITS

## *applied to*

# MECHANICS



**W**E find quite a few tools and parts—no large parts, but mostly small ones, such as nuts, bolts, clamps . . . We find all kinds of tools, such as hammers, pliers, wrenches, screwdrivers, Allen wrenches, lock-wire, being left in aircraft after maintenance.

### **A Place for Every Tool, Every Tool In Its Place**

A wrench, a screwdriver, a pair of pliers inadvertently left inside an engine cowl, in a wheel well or in the control system may be more serious than a forceps, a sponge or a knife left inside a patient by a surgeon. One may kill 50 people, the other only one.

Surgeons rarely leave a "tool" inside a patient. Believing that the system practiced in the operating rooms of a hospital may provide the clues to reduce the chances of a mechanic leaving his tools in an airplane, we visited Miss Edna Tuffley, Department Head of Operating Rooms of the New York Hospital.

**Point 1 is training:** Nurses are trained to a high degree of personal responsibility and integrity. This is continually instilled in nurses all during their training. Those who don't respond are weeded out.

**Note:** Constant dealing with the sick and injured may enable this to be driven home more readily in a hospital than on an airport where a mechanic seldom, if ever, sees the pain and suffering which his mistake may cause. (APPROACH helps here by providing concise informative material on accidents or near accidents caused by mechanics.)

**Point 2 is morale:** This is obtained by forming operating "teams" which stay together, coordinate easily. Responsibility for sponge and instrument count is fixed on two members of the operating team to reduce likelihood of error due to possible turnover of personnel. A good esprit de corps is part of this practice. Spotless white uniforms

help give a sense of professional responsibility, of training and morale.

**Point 3 is a double check:** With this strong background to reduce the human error, the actual procedure followed in the operating room is for two nurses (one called "sterile," the other "non-sterile") to count each sponge by a system of challenge and response similar to the use of checklists by pilot and copilot. The non-sterile nurse signs a form to indicate that the count has been completed correctly. The form lists each sponge. Attached to each sponge is an x-ray opaque tape. If a sponge should be missing, it can readily be located by an x-ray machine which picks up the tape. X-ray, of course, is also used to locate any missing instrument.

Instruments are checked before the operation. They are usually arranged in a tray in groups of six for easy counting. They are replaced in tray immediately after use—not left lying around. A quick survey of the tray after the operation reassures the replacement of all "tools." Not many instruments are left at the operative field at the end of the surgery.

How may this be applied to the mechanic:

1. **Training:** Use same system as hospitals (already in use by most airlines). Train for a high degree of personal integrity. Weed out the slothful trainees.

2. **Morale, Esprit de Corps:** Competition between maintenance crews may boost morale and teamwork. If this cannot be done, then perhaps competition between stations or between divisions could be devised. Professional attitude may be encouraged by fixing special responsibility, by recognition of extraordinary efficiency.

3. **Double check:** A mechanic's helper should be taught to check for tools. The tool chest should have a marked place for each tool, mechanic should not leave the airplane until each tool is in place, checked by him and rechecked by his helper.

FSF Bulletin



## MURPHY'S LAW\*

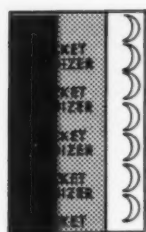
During the 15-month period ending March 1960 maintenance men inadvertently crossed pitot/static lines in seven airplanes. Resulting aborted takeoffs caused varying degrees of damage. Aircraft involved included four F4Ds, an A4D, FJ and an F3H. While the primary error must be assigned to mechanics in that a functional check of the system was not performed after the lines were reconnected in accordance with Instrument Bulletin 29-46, the designer cannot be absolved of his share of the blame. The age-old Murphy's Law design has booby-trapped mechanics into crossing lines many, many times.

Despite the fact such an error is more hazardous to high performance aircraft our

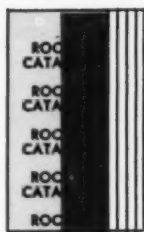
designers tend to ignore its implications in violation of the precept that once errors have been revealed and a fix established, these should never be permitted to reappear again in a later design in any type of aircraft. So, until this booby trap is designed out of aircraft, mechanics must rely on color-coding to guide them in reconnecting system tubing and must functionally check the system every time the lines are reconnected.

This article points up the airspeed/static system difficulties but we've had similar difficulties in the plumbing of other systems, the least serious of which was the time a relief tube venturi was installed backwards on an S2F. The pilot, an exchange international, put it quite aptly, "Good cab, matey, but I'd prefer a dry ride."

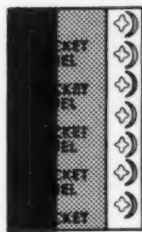
To help orient you with the color coding system, aeronautical design standard AND 10375 is reproduced on the following page.



Rocket Oxidizer



Rocket Catalyst



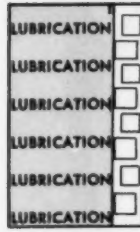
Rocket Fuel



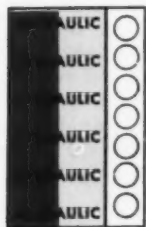
Fuel



Water Injection



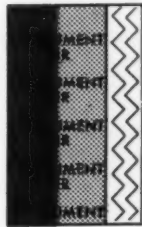
Lubrication



Hydraulic



Compressed Gas



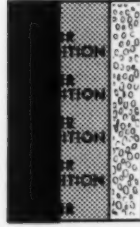
Instrument Air



Coolant



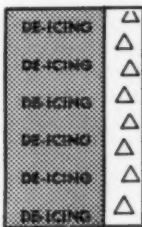
Breathing Oxygen



Air Condition



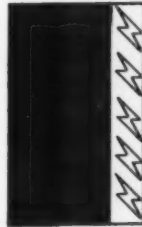
Fire Protection



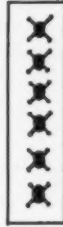
De-Icing



Pneumatic



Electrical Conduit



Warning Symbol

## IDENTIFICATION COLORS for FLUID LINES (AND 10375)

The above color codes represent designation for systems only. For coding lines which do not fall into one of these systems the contents shall be designated by black lettering on a white tape.

Subsidiary functions or identification of line content may be indicated by the use of additional words or abbreviations which shall be carried on a second tape adjacent to the first or alternatively, interposed between the words descriptive of the main function.

Warning symbol tapes, 3/8-inch wide, shall be applied to those lines whose contents are considered to be dangerous to maintenance personnel, warning tapes are to be placed adjacent to system identification tapes.

One band shall be located on each tube segment, 24 inches or shorter. One band shall be located at each end of each tube segment longer than 24 inches. Additional

bands shall be applied when the tube segment passes through more than one compartment or bulkhead. At least one band shall be visible in each compartment or on each side of the bulkhead.

Pressure transmitter lines shall be identified by the same colors as the lines from which the pressure is being transmitted.

Filler lines, vent lines and drain lines of a system shall be identified by the same colors as the related system.

Tapes shall not be used on fluid lines in the engine compartment where there is a possibility of the tape being drawn into the engine intake. For such locations, suitable paints, conforming to this color code, and which have no deleterious effect on the material used for the lines, shall be used for identification purposes. In these cases the geometrical symbols may be omitted.

# CLIPBOARD

## Emotional Fitness

**T**HE safe and effective operation of high performance aircraft requires prolonged periods of close attention, ability to ignore distractions, and the highest degree of emotional control. Attention to the job-at-hand can be dangerously diverted by concern about unrelated problems.

The pilot who is preoccupied with personal, domestic, squadron or other problems should not be flying. The adverse effect of subconscious conflicts, not readily apparent to the pilot, should nonetheless be understood by him. The pilot, more than any other individual, should be "honest with himself" in matters of motivation, confidence, capabilities and primary concerns.

—OpNavInst 3740.7, 25 June 57

## Radio Failure Instrument Approach Procedure

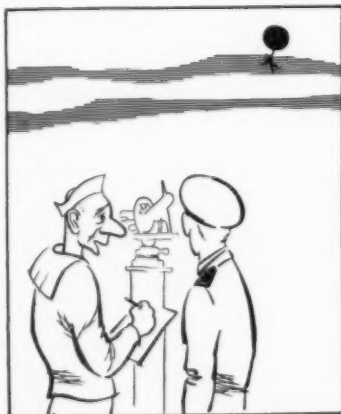
**O**PERATIONS is processing a violation on a pilot who made a "Radio Out" unauthorized VOR letdown into the destination from a feeder VOR facility instead of arriving over the primary VOR facility servicing the air base, and then making the letdown at the proper time.

Presently, there are several high altitude letdown plates presenting instrument approaches to air bases where the letdown is begun at a "feeder" VOR facility with the letdown continuing to the primary VOR facility servicing the air base. However, a note appears on these plates as follows: "Note: This procedure will not be executed in the event of radio failure unless approach clearance has been received."

The pilot did not see this note on the letdown plate. Consequently, he made the approach and letdown utilizing this unauthorized procedure. Check the letdown plates during your preflight preparation for this note. If you have to make a radio failure instrument approach at your destination or alternate, be sure that you are using the approved letdown procedure on the radio facility servicing the destination air base.—WRAMA "Fly Safe" Bulletin

## Don't Spin the Dial

**H**ERE'S a caution worth noting. According to a friendly fleet operator, when the Omni Bearing Selector is dialed too fast, causing it to spin, the counter mechanism is sure to suffer damage, specifically, shearing off the teeth of the gear. Not only is repair costly but reliability of this navigational aid can be vastly impaired.—"The MATS Flyer"



"We can't seem to get enough pilot reports."

## Welcome Mat

**"T**HE Air Rescue Service and the U. S. Coast Guard extend a welcome invitation to all pilots to visit any of their rescue units. By so doing pilots may become more familiar with the actual means whereby this vital phase of aviation safety is carried out. The location and address of your nearest rescue unit may be obtained from the FAA or any AF or CG facility." —Flight Information Manual

## Visibility Reports In Statute Miles

**K**NOTS and nautical miles have become so accepted, it is easy to forget that visibility is still given in statute miles. Sequence reports carry visibility in statute miles, wind in knots, direction true. Tower reports are the same except wind direction is magnetic.

—TWA "Flite Facts"

## Initial Contact With ATC Centers

**P**ILOTS are not always following the proper procedures when establishing initial radio contact with ATC centers. The procedure pilots most often stumble over is the one which requires an estimate be forwarded for the next compulsory reporting point when initial contact is made at a place not requiring a position report.

—TWA "Flite Facts"

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## Keep it Going

**W**HILE leaving Chicago on a fast train, a passenger observed a large ad in one of the current magazines on Wrigley's Chewing Gum. Turning to Mr. Wrigley who happened to be sitting next to him, he asked how much such an ad cost. Mr. Wrigley casually mentioned \$18,000. The passenger thought it a large sum.

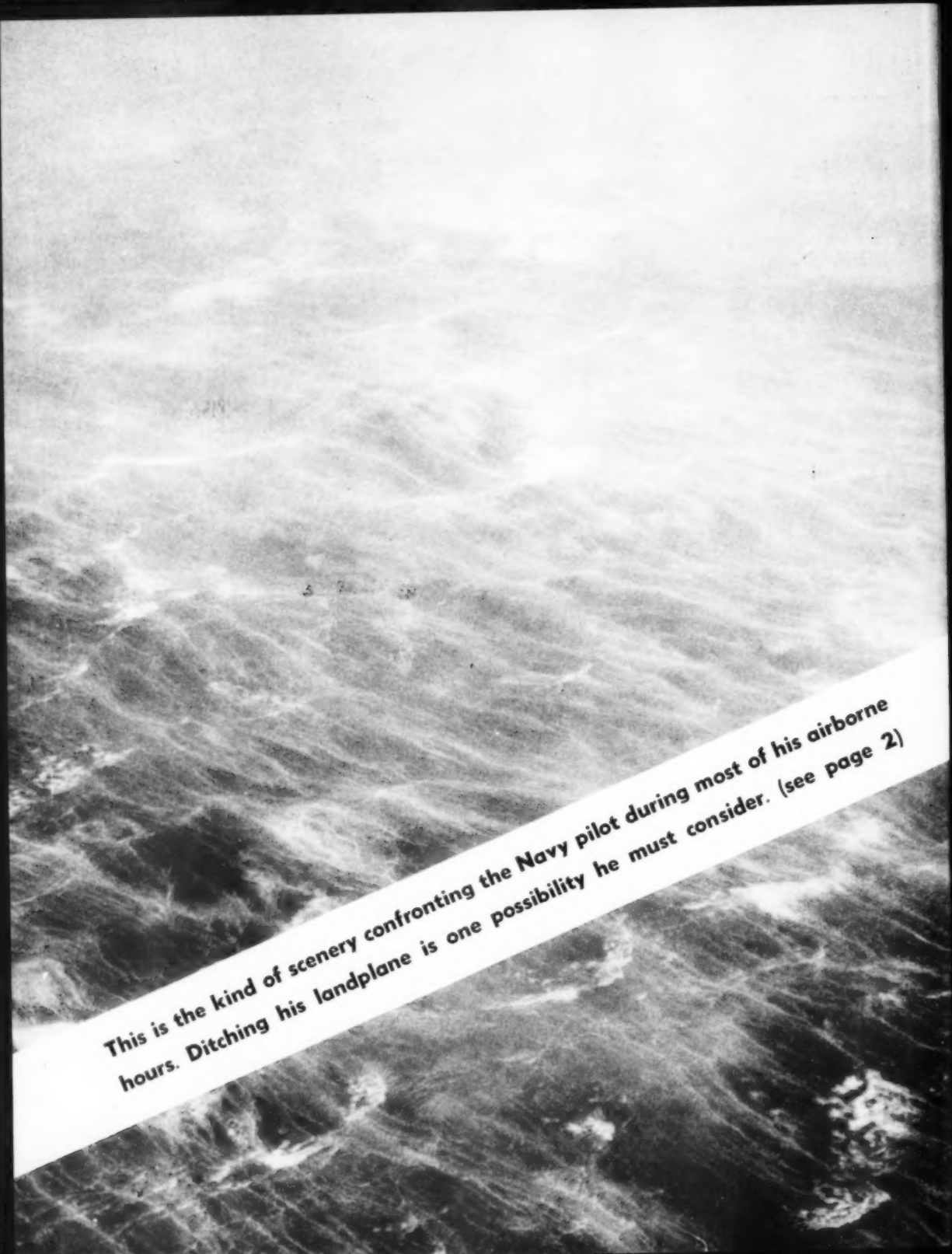
"After all, Mr. Wrigley," he said, "you have everybody sold on your chewing gum already. It will take the sale of millions of slices of gum to get back the \$18,000."

Mr. Wrigley smiled and asked how he liked the train they were on. "OK," said the man. "How fast do you think it is going?" asked Wrigley.

"About 80 mph," was the reply. "Don't you agree it is going good?" he then asked. "Why, yes, I think it is going fine."

"Would you then take off the locomotive?" Wrigley inquired.

That's how it is with the aviation safety program—it must be kept hooked onto the train of operations at all times and kept in good working order, because it is the locomotive that keeps the train going.—"Safety Newsletter," National Safety Council



This is the kind of scenery confronting the Navy pilot during most of his airborne hours. Ditching his landplane is one possibility he must consider. (see page 2)

